Twelfth Annual

RESEARCH REPORT

North Central Weed Control Conference

1955

Omaha, Nebraska

December 6, 7 and 8

This report gives brief, up-to-date results of experiments in weed control. Many of the experiments are not completed but are useful in furnishing leads for further research. This is especially true of results with new herbicides or new uses of established herbicides. This report is not intended to supplant full publication of research findings in established journals.

The Research Report has resulted from the cooperative efforts of 151 contributors of abstracts and of the 30 members of the Research Committee who assembled the material, cut the stencils and submitted them promptly for mimeographing.

Dayton L. Klingman
Chairman, Research Committee

RESEARCH COMMITTEE -- 1955

Chairman - Dayton L. Klingman, Field Crops Research Branch, U.S.D.A., and University of Missouri, Columbia, Missouri

Vice-Chairman - W. C. Elder, Vice-Chairman, Agronomy Department, Oklahoma A. & M. College, Stillwater, Oklahoma

Project Summarizers --

Quackgrass - - - - - - - - - - - E. A. Helgeson, Botany Department, State College Station, Fargo, North Dakota

Johnson and Bermuda- - - - - - O. H. Fletchall, Department of Field Crops, University of Missouri, Columbia, Missouri

Canada Thistle and Perennial Sow Thistle - C. J. Willard, Agronomy Department, Ohio State University, Columbus, Ohio

Leafy Spurge and Russian Knapweed - L. A. Derscheid, Agronomy Department, South Dakota State College, College Station, South Dakota

Field Bindweed - - - - - - - - - W. M. Phillips, Field Crops Research Branch, U.S.D.A., and Kansas Agricultural Experiment Station, Hays, Kansas

Hoary Cresses and Bur Ragweed -P. F. Sand, Agronomy Department, University of Nebraska, Lincoln, Nebraska

Toadflax and Other Perennial Herbaceous Weeds - H. A. Friesen, Dominion Experiment Station, Lacombe, Alta., Canada

All Annual, Winter Annual, and Biennial Weeds - R. S. Dunham, Division of Agronomy and Plant Genetics, University of Minnesota, University Farm, St. Paul, Minnesota

Spring Sown Grain- - - - - - - - W. J. Breakey, Dominion Experimental Station, Morden, Manitoba, Canada

Fall Sown Grain and Sorghum- - L. E. Anderson, Agronomy Department, Kansas State College, Manhattan, Kansas

Corn - - - - - - - - - - - - - - D. W. Staniforth, Department of Botany and Plant Pathology, Iowa State College, Ames, Iowa

Flax - - - - - - - - - - - - - - R. G. Robinson, Division of Agronomy and Plant Genetics, University of Minnesota, University Farm, St. Paul, Minnesota

Soybeans - - - - - - - - - - - - F. W. Slife, Agronomy Department, University of Illinois, Urbana, Illinois

Forage Legumes - - - - - - - - - P. F. Sand, Agronomy Department, University of Nebraska, Lincoln, Nebraska

Herbaceous Weeds in Pastures and Meadows - M. K. McCarty, Field Crops Research Branch, U.S.D.A., Weed Investigations Section, and University of Nebraska, Lincoln, Nebraska

Sugar Beets- - - - - - - - - - - R. N. Andersen, Field Crops Research Branch, U.S.D.A., and North Dakota Agricultural College, Fargo, North Dakota

Turf - - - - - - - - - - - - - - O. C. Lee, Botany and Plant Pathology Department, Purdue University, West Lafayette, Indiana

Field and Canning Peas - - - - J. J. Sexsmith, Experiment Station, Lethbridge, Alberta, Canada

Vegetable "Root" Crops - - - - E. K. Alban, Department of Horticulture, Ohio State University, Columbus 10, Ohio

Other Vegetables - - - - - - - - G. F. Warren, Horticulture Department, Purdue University, Lafayette, Indiana

Flowers- - - - - - - - - - - - - J. P. Mahlstede, Horticulture Department, Iowa State College, Ames, Iowa

Fruits - - - - - - - - - - - - - D. D. Hemphill, Horticulture Department, University of Missouri, Columbia, Missouri

Ornamental Nurseries, Forest Nurseries, Shelterbelts and All Others - J. P. Mahlstede, Horticulture Department, Iowa State College, Ames, Iowa

Brush on Rangeland and Pastures - H. M. Elwell, Field Crops Research Branch, U.S.D.A., and Oklahoma Agricultural Experiment Station, Box 465, Guthrie, Oklahoma

Brush on Rights-of-way - - - - R. H. Beatty, Agricultural Chemicals Division, American Chemical Paint Company, Ambler, Pennsylvania

Brush in Forests and Plantings - H. L. Hansen, School of Forestry, University of Minnesota, University Farm, St. Paul, Minnesota

Alternate Hosts and Other Woody Plant Problems - J. E. Kuntz, Department of Plant Pathology, University of Wisconsin, Madison, Wisconsin

Chemical Drying and Pre-harvest Weed Control - W. M. Phillips, Field Crops Research Branch, U.S.D.A., and Kansas Agricultural Experiment Station, Hays, Kansas

New Herbicides - - - - - - - - - W. C. Dutton, Dow Chemical Company, Midland, Michigan

Mechanical Considerations and Aerial Applications - R. E. Larson, Agricultural Engineering Research Branch, U.S.D.A., and University of Missouri, Columbia, Missouri

Basic Studies in Botany, Ecology and Plant Physiology - W. E. Loomis, Department of Botany and Plant Pathology, Iowa State College, Ames, Iowa

TABLE OF CONTENTS

Canada thistle (Cirsium arvense)

Summary

C. J. Willard

The receipt of twelve abstracts from nine institutions testifies to a greater interest in Canada thistle this year than last. Only one of these mentioned sowthistle. Five of these were almost entirely concerned with 2,4-D or MCP in various formulations; three were on amino triazole entirely and four more reported tests including ATA; one was on CMU entirely, and various other herbicides were included in one or more tests.

The results with MCP and 2,4-D were in accord with results previously reported, bud stage being most favorable for starting work, no single treatment 100% successful, repeated treatments, especially combined with cultivation almost or entirely so Heavy late autumn applications up to forty pounds were a failure under humid conditions. Two heavy (8 lb/A) treatments with 2,4-D ester following three cultivations apparently gave complete kills in one season.

CMU gave a complete kill of thistles only at 100 lb/A, an amount which has prevented all growth of weeds or crops since 1951. Other materials were of varying success.

As last year amino triazol was the most promising material reported. It also has not been 100% effective at any one application, but some single applications have frequently approached this. Stage or condition of growth seems more important even than with 2,4-D, and much more work is needed to isolate the stages or conditions under which ATA is most effective. An especially promising lead at least in the southern half of the region, is to treat after growth is well started and plow for corn or soybeans after ten days to three weeks. Several trials of this combination have resulted in almost no recovery of thistles. Corn and soybeans were not injured at any rate of ATA used in this way. ATA-2,4-D mixtures have not been promising.

Abstracts

Effect of various herbicides on Canada thistle. Bakke, A. L. and Sylwester, E. P. A heavy infestation of Canada thistle growing on pasture land near Estherville, in the northwestern part of Iowa, was treated July 6, 1955 with (1) MCP ester 2 lb/A, (2) Amino triazole-MCP mixture (PA 551) 10 lb/A, (3) Amino triazole 5 lb/A, (4) 2,4-D, LV ester, 2 lb/A, (5) 2,4-D, Amine 2 lb/A, (6) MCP ester 1 lb/A, (7) PA 551, 5 lb/A, (8) Amino triazole 2½ lb/A, (9) 2,4-D, LV-ester, 1 lb/A, (10) 2,4-D Amine 1 lb/A, (11) Atlacide-2,4-D mixture, (12) Brush killer. The thistles had been cut June 20; at time of treatment, they were 8-10 inches tall. On September 22, the thistles were sprayed again with the same materials and at the same concentration. On September 22, the results of one treatment were as follows: (1) 95 per cent kill, (2) 90 per cent, (3) 98 per cent, (4) 50 per cent, (5) 85 per cent, (6) 50 per cent, (7) 95 per cent, (8) 50 per cent, (9) 85 per cent, (10) 95 per cent, (11) 95 per cent. The season had been dry, particularly through July. Further evaluation will be made in 1956. (Contribution of Iowa Agricultural Experiment Station and Extension Service)

Amino triazole on Canada thistle. Bondarenko, D. D. and Willard, C. J. Triplicated square rod plots infested with Canada thistle were treated with Amizol at 2, 4, and 6 lb/A in 80 gpa spray April 28, 1955 and at 2, 4, 6, 8, and 12 lb/A on May 5, 11, 16, 18 and 24, June 1 and 17. Plots treated April 28 were plowed May 25; plots treated May 5, 11 and 16 were plowed May 18 and planted to corn May 20. Plots treated May 18 and 24, June 1 and 17 received no additional treatment. On October 22 plots treated April 28 and May 5 and plowed May 25 and May 18, respectively, indicated a 90 to 100 percent kill at all rates; the 12 lb/A rate was slightly more effective than the 2 lb/A rate. Corn was not injured at any date or rate. Plots treated May 11 and plowed nine days later gave apparent kills of 40 percent at 12 lb/A to 0 percent at 2 lb/A. Plots treated May 16 and plowed two days later showed almost no effect, and supplemental treatment with alkanol amine salt of 2,4-D at 1/2 lb/A three hours before Amizol application did not increase the percent kill. The original plants in the plots treated May 18 and 24, June 1 and 17 and not plowed died in one to three months but dense regrowth had occurred by October 22 on all plots. Most rapid death of tops and slowest regrowth followed the highest rates. Treatment with alkanol amine salt of 2,4-D at one lb/A June 17 on plots treated previously with Amizol June 1 did not improve the results. Treatments with Amizol at full bloom, June 17 and 23, were ineffective even at 15 lb/A. Mowing on June 20 did not affect the results. Thistle plots were plowed May 25 and the regrowth treated with Amizol at 4, 8, 12, and 16 lb/A June 29 and August 5, when plants were 1 to 6 and 4 to 30 inches high, respectively. On October 22 all plots treated June 29 had so much regrowth as to indicate almost no effect; those treated August 5, 95 percent stand reduction, with no differences between rates. Thistles 1 to 6 inches high on plots plowed May 25 were treated wutg Amizol at 2, 4, and 6 lb/A June 29 and re-treated at the same rates July 6. Similarly, regrowth 4 to 30 inches received two treatments at 2, 4, and 6 lb/A August 5 and 12, respectively. On October 22 all plots treated June 29 and re-treated July 6 indicated 50 percent stand reduction with only slight differences between rates. Plots treated August 5 and again August 12 showed about 95 percent kill; the kill was only slightly lower at the 2 lb/A rate. Thistle regrowth 2 to 10 inches high on plots plowed May 25 and treated July 13 with Amizol at 6 and 12 lb/A in 20, 40, 80, and 160 gpa spray was reduced in stand 80 percent on October 22; no differences being discernible between dosage or spray volume. Further observations on all treated plots will be made in 1956 to supplement data recorded this year. (Contribution of Ohio Agricultural Experiment Station.)

Amino triazole ACP 733; 2,4-D and 3,4-D alone and in mixtures for control of Canada thistle, 1955. Brown D. A. A thick vigorously growing stand of Canada thistle in bud stage and on land cultivated three times in 1955, prior to July 15, was treated August 12, with single doses of amino-triazole ACP 733, 2,4-D LV-4 ester, and 3,4-D each at 8 lb/A active acid. In addition mixtures of the amino-triazole with 2,4-D and 3,4-D at 5 lb/A each were applied. Results: Examination of plots August 22, revealed that 2,4-D alone and mixed with amino-triazole had killed all evidence of above ground growth; 3,4-D alone had severely twisted bud stems but green shoots were common throughout the plots. When mixed with amino-triazole results were somewhat better. Amino-triazole alone had severely twisted bud stems but many green shoots remained and growth generally remained green. Retreatments were carried out September 12, at right angles to the first treatments in order to provide a maximum of combinations and comparisons. All plots were thoroughly cultivated September 27. A root survival survey made October 14, failed to show any live roots or shoots to a depth of 8 inches on plots treated with 2,4-D and combinations including 2,4-D. Live root

sections were common but no live shoots in plots receiving 3,4-D alone and in combination with amino-triazole. On plots treated with amino-triazole alone live root sections were common and small percentage of live roots. Final results will be recorded in 1956. (Contributed by Experimental Farm, Brandon, Man.).

Soil sterility studies with CMU. Friesen, George. Non-replicated 12 x 12 ft. plots were treated with CMU at 25, 50, and 100 lb/A in 1951 and at 5 and 15 lb/A in 1952 at Winnipeg on heavy clay loam. Weeds originally present in the area were Canada thistle, sow thistle, red-root pigweed, and common willow. It was observed originally that at least 25 lb/A of CMU was necessary to control the weed species listed. In the succeeding years re-invasion of weeds and crop tolerance was noted on these plots. In 1955 Canada thistle had re-invaded all the plots except where 100 lb/A had been applied. Plots where CMU at rates up to 25 lb/A had been applied were very weedy in 1955 with Canada thistle, dandelion, stinkweed, wild mustard, and sow thistle predominating. Wheat, oats, flax, sunflowers, peas, and corn planted on June 22, 1955 survived on all plots treated with CMU at 5 and 15 lb/A. Where 25 lb/A had been applied only corn and flax survived, and the 50 lb/A rate allowed only corn to grow. The plot receiving the 100 lb/A rate remained completely free of vegetation throughout 1955. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg, Canada.)

Herbicides for the control of Canada thistle. Friesen, H. A. In 1955 various herbicides were applied to a dense stand of Canada thistle growing in Olli barley. The thistle was in the late bud stage at the time of application. Results: Amizol at 5, 10 and 20 lb/A killed 80, 90 and 100 percent of the top growth. In October of 1955 some evidence of regrowth was noted only on the 5 and 10 lb/A treated plots. Chlorea at 4 and 8 lb/sq. rod completely killed the top growth and no recovery was observed this year. DB (borate and 2,4-D mixture) at 1, 3 and 6 lb/A resulted in a similar control of the thistle as the Chlorea but most of the barley, while severely stunted, survived and set seed. Polychlorobenzoic acids (coded as Hooker X-42-S, X-42-EO, X-33-S and X-33-EO) each applied at 8 lb/A deformed and eventually killed the top growth of the thistle. Survival of barley ranged as high as 50 percent. X-33-S and X-42-S appeared to be more drastic and rapid in their action than the other two formulations. Boron at 1½ pt/sq. rod halted the thistle growth and prevented flower and seed formation. At 2 pt/sq. rod the top growth was killed to the ground and there was no evidence of recovery. Further appraisal of these treatments will be made in 1956. (Contributed by the Experimental Farm, Lacombe, Alberta.)

Spot treatment of Canada thistle with Amizol (3-amino-1,2,4-triazole). Guest, R. T., Neatty, R. H., and Tafuro, A. J. In May, 1954, Amizol (3-amino-1,2,4-triazole) was applied to Canada thistle in Carlisle, Pa., as a spot treatment at rates of 2, 4, and 8 pounds (active ingredient) in 25 gallons and 100 gallons of water. Applications of Amizol in 25 gallons of water were made to just wet the plants. Rates used in 100 gallons of water were applied as a drenching spray. Application was made to Canada thistle in the bud stage. In early September, 1954, three months after spraying, observations were taken. Results - 8 pound application (both in 100 gallons and 25 gallons of water) gave 100% top kill with no regrowth appearing at this time. Four pounds Amizol (both in 100 gallons and 25 gallons of water) gave 98% top kill and no regrowth at 3 months after spray. Two pounds Amizol application (both in 100 gallons and 25 gallons of water) gave 90% top kill and no regrowth when observed 3 months after application. Observations taken in early September, 1954, 3 months after application, did not show any difference between using the different rates in 25

gal
dif
poi

aft
app
wha
enc
by

app
Alt
uni
2,4
All
a t
som
but
occ
con
be

of
den
sho
res
stu
Exp

(So
wit
20
2,4
bud
equ

equ
pla
the
and
bet
The
to
at
for
act
cro
app
wei
were

gallons of water and spraying to a slight wetting of the plant and using the different rates in 100 gallons of water and thoroughly drenching the plot to point of run-off.

1955 Observations - 8 pounds Amizol observed in June, 1955, 13 months after application, showed no regrowth. Four pounds Amizol, 13 months after application, showed only a 10% regrowth whereas 2 pounds gave a 20-25% regrowth when observed in June, 1955, 13 months after application. There was no difference in regrowth suppression between the volume of water used. (Contributed by Agricultural Research Division, American Chemical Paint Co., Ambler, Pa.).

Heavy applications of 2,4-D for control of Canada thistle and fall applications of amino triazole on Canada thistle. Ham, G. F. and Willard, C. J. Although our results with heavy applications of 2,4-D on Canada thistle were uniformly unsatisfactory in 1953-54, we applied both amine and ester forms of 2,4-D at 10, 20, and 30 pounds per acre on November 1 and November 20, 1954. All treatments were triplicated, and several cultural treatments were included, a total of 54 treated plots and 36 checks. The following spring growth was somewhat slower in starting on the treated plots than on the untreated checks, but by the middle of May regrowth approximately equal to the original stand had occurred on all treated plots. So far as rates up to 30 pounds per acre are concerned, there is no suggestion that heavy late fall treatments with 2,4-D will be in any way a solution of our Canada thistle problem.

Amino triazole was also applied to Canada thistle in September at rates of 2, 4, and 8 pounds per acre. While some regrowth occurred on all plots, and dense regrowth on the plots receiving 2 pounds, those receiving 8 pounds have shown reduction in stand of over 50 percent for the entire year. While these results are in no way conclusive, fall treatments with amino triazole should be studied in Canada thistle eradication. (Contribution of Ohio Agricultural Experiment Station.)

Control of Canada thistle (Cirsium arvense) and perennial sow thistle (Sonchus arvensis) with MCP and 2,4-D. Keys, C. H. An area heavily infested with Canada thistle and perennial sow thistle and sown to oats was divided into 20 strips 10' wide by 150' long. Single applications of MCP ester and amine; 2,4-D ester and amine were applied on July 9, when the thistle was in the early bud stage. Rates of each formulation were 1/4, 1/2, 1, 2 and 4 lb/A acid equivalent per acre.

The 1/4 lb/A rates provided very little control and growth was nearly equivalent to non-treated area. The 1/2 lb/A rates allowed about 5% of the plants to flower and about 50% of the Canada thistle was still hanging on by the end of August. By October these surviving plants remained about the same and there were a few new plants beginning. The 1 lb/A rate provided muchh better control with about 15-20% regrowth by fall. There was no seed formed. The 2 lb/A rates held regrowth to about 10% while the 4 lb/A rate held regrowth to about 5% or less. It was observed that nearly half the regrowth that appeared at the two higher rates were new plants. The difference in effect between formulations was very small. The ester of 2,4-D and MCP were slightly faster acting than the amines and were slightly more effective at equivalent rates. The crop did not appear to suffer unduly from the effect of the high rates of chemical applied. There was insufficient variation in thousand kernel weights or bushel weights to indicate damage to the grain. Due to variation in crop stand, yields were not taken. (Contribution by Experimental Farm, Scott, Sask.).

Two years results with amino triazole on Canada thistles. Lee, O. C. Results of applications of amino triazole made on May 13, 1954 were reported in the research report of 1954. Average number of Canada thistle (Cirsium arvense) plants per sq. yd. surviving on these plots on September 28, 1955 were 22, 4, 0.4 and 0.5 for checks and treatments of 2, 4 and 8 lb/A of amino triazole respectively. The portion of the plots clipped on May 20 following spraying had 19, 8, 6 and 6 plants surviving per sq. yd. for checks and treatments of 2, 4 and 8 lb/A respectively. Poor results were obtained with applications made on October 21, 1954. Two and 4 lb/A gave no results. The 8 lb/A rate reduced the stand approximately 50 percent. Results of applications of amino triazole made during 1955 are similar to those obtained in 1954. Treatments applied on May 16 (thistles 6-10 in. tall) at rates of 4, 6 and 8 lb. in 30 gal. of water per acre on plots 576 sq. ft. in area reduced the stand of thistles, as recorded on October 6, from 2489 plants on checks to 4, 2 and 1 plants per plot for treatments respectively. Other plots 1 sq. rd. in size were treated with 4, 6, 8, 10 and 12 lb/A on June 5 (thistles were 12-15 in. tall). Plants surviving on plots on October 6 were as follows: Check - 710, treatments of 4 lb. - 26, 6 lb. - 9.6, 8 lb. - 5.6, 10 lb. - 5.3 and 12 lb. - 3.0 per sq. rd. Mid-summer treatments made during bloom stage and later were not effective. Combinations of amino triazole and 2,4-D appear to be less effective than amino triazole alone. Preliminary trials indicate that corn and soybeans can be planted on treated areas approximately 21 days after amino triazole is applied at rates of 4, 6 and 8 lb. (Contribution of the Department of Botany and Plant Pathology, Purdue University Agricultural Experiment Station.)

Comparative effectiveness of 2,4-D as acid, butoxy ethanol and ethyl esters on Canada thistle. 1954-55. Pavlychenko, T. K. In this test results are presented on relative effectiveness of 2,4-D when applied in a form of straight acid (ACP638); low volatile butoxy ethanol ester (ACP659), and ethyl ester (Weedone Concentrate). The materials were used at 1½, 3 and 6 lb/A (acid equiv.) at rosette, bud and mowed - bud stages in four different ways: (T) - one application only; (TC) - one application and cultivation, when new shoots were in early rosette; (TR) - initial treatment followed by retreatment at the initial rates, when regrowth reached rosette stage; and (TRC) - initial treatment followed by cultivation and retreatments, when the regrowth over cultivated areas was in early rosette. The experiment was started on June 30, 1954. Careful, replicated counts were taken during the growing seasons of 1954 and 1955.

Percent of original population remaining in 1955 after treatment at

Treatments		1 1/2 lb/A T	TC	TR	TCR	3 lb/A T	TC	TR	TCR	6 lb/A T	TC	TR	TCR
Rosette stage													
ACP 638	1954	62	44	51	37	31	27	46	13	20	33	26	15
	1955	72	61	120	131	12	10	30	9	12	10	17	10
ACP 659	1954	43	35	48	29	35	16	42	17	31	27	30	22
	1955	16	20	11	14	11	16	28	27	37	6	15	6
Weedone Con.	1954	60	30	20	62	60	27	40	28	47	103	88	7
	1955	20	23	16	20	30	13	20	14	27	19	27	5
Bud stage													
ACP 638	1954	45	13	14	21	21	11	14	18	17	9	12	10
	1955	9	4	23	17	8	0	0	0	5	0	3	2
ACP 659	1954	30	14	22	15	13	7	9	10	18	12	13	14
	1955	7	0	10	3	6	3	3	0	6	0	6	0
Weedone Con.	1954	30	24	28	16	24	23	25	4	50	4	5	8
	1955	10	5	14	11	7	4	7	1	3	4	4	6
Mowed at bud													
ACP 638	1954	46	26	40	18	111	114	56	20	100	42	81	60
	1955	27	31	45	31	100	28	18	14	55	11	27	20
ACP 659	1954	163	8	16	3	50	15	14	18	16	15	11	11
	1955	17	16	16	7	16	14	20	11	8	8	6	11
Weedone Con.	1954	90	54	42	10	68	36	32	20	95	38	81	14
	1955	110	36	35	8	25	27	18	11	35	19	19	6

In the above table, the treatments which consistently gave satisfactory results are underlined. Of the three stages treated, plots mowed immediately prior to treatments produced from weak to very poor results in 1954 irrespective of rates, cultivation and retreatments. In 1955, the results improved considerably, yet were regarded as agronomically unsatisfactory, mainly, because of the vigor of surviving stand. To a lesser degree, this was true with the rosette stage, although the reduction in stand and the retardation of regrowth was highly significant. The three chemicals at all rates were most effective at bud stage with butoxy ethanol ester and straight acid giving highly significant reduction in stand in 1954, and fully satisfactory control to complete elimination of the weed in 1955. Ethyl ester gave good results at the two higher rates. (Contributed by Agricultural Division of American Chemical Paint Company, Saskatoon, Saskatchewan.).

Effect of butoxy ethanol ester of 2,4-D (ACP 659) on Canada thistle. 1954-55. Pavlychenko, T. K. A dense infestation of Canada thistle on light loam soil was treated with 1½, 3 and 6 lb/A, acid equivalent, of 2,4-D in a form of butoxy ethanol ester. A block of land 150 x 150 ft. was divided into three 50 x 150 ft. "rate strips" lengthwise and into three similar "stage strips" crosswise. On June 30, 1954, when the weed was in advance rosette stage, the first "stage strip" was treated with 1½, 3 and 6 lb/A rates. On July 17, 1954, at the bud stage, the second "stage strip" was treated at the same three rates. On the same day the third "stage strip" was mowed and immediately treated also at 1½, 3 and 6 lb/A rates. In this manner the project was broken into nine "rate-stage" units of 50 x 50 ft. On August 19, when the regrowth in the second ("bud stage") strip was in rosette stage, one-half of each "rate strip" was cultivated. On September 11, when the sprouts began to appear over the cultivated areas, one-half of each "stage strip" was retreated at the three initial rates.

By the cultivation and retreatment, each of the nine "rate-stage" units had been further subdivided into four 25 x 25 ft. plots, named:

(1) T - - - initial treatments ($1\frac{1}{2}$, 3 and 6 lb/A)
(2) TC - - - Initial Treatments and Cultivation
(3) TR - - - Initial Treatments and Retreatments
(4) TCR - - - Initial Treatments, Cultivation and Retreatments

An average data on the effectiveness of different treatments as obtained from records in 1954 and 1955 may be presented as follows:

		$1\frac{1}{2}$ lb/A				3 lb/A				9 lb/A			
Treatments		T	TC	TR	TCR	T	TC	TR	TCR	T	TC	TR	TCR
		Percent of original stand remaining											
Rosette stage													
	1954	43	35	48	29	35	16	42	17	31	27	30	22
	1955	16	20	11	14	11	16	28	27	37	6	15	6
Bud stage													
	1954	30	14	22	15	13	7	9	10	18	12	13	14
	1955	7	0	10	3	6	3	3	0	6	0	6	0
Mowed at bud													
	1954	163	8	16	3	58	15	14	18	16	15	11	11
	1955	17	16	16	7	16	14	20	11	8	8	6	11

The above results illustrate several important points:

(1) At "bud stage" all rates gave a much greater suppression of stand in the season of treatment. (1954) and a year later in several treatments the stand was reduced 100%.
(2) Subsequent cultivation, when regrowth over the treated areas was in early rosette stage, has increased the effectiveness of initial treatments about to the same extent as retreatments.
(3) Mowing of the top growth just prior to treatment does not help but rather interferes with the action of this chemical.

(Contribution by Agricultural Division of American Chemical Paint Company, Saskatoon, Saskatchewan.).

Controlling Canada thistle with amino triazole, 1954-55. Pavlychenko, T. K. In 1954, a fairly uniform infestation of Canada thistle (4 to 26 plants/sq. yd.) was used to test effects of Amizol (3-amino-1,2,4-triazole) on this species. An area 150 x 150 ft. was divided lengthwise into three equal "rate strips" of 50 a 150 ft. to be treated with $1\frac{1}{2}$, 3 and 9 lb/A of Amizol respectively. This area was also divided crosswise into three equal "stage strips" of 50 x 150 ft. On June 30, when the weed was in rosette stage, the first "stage strip" was treated with $1\frac{1}{2}$, 3 and 9 lb/A. On July 16, at bud stage, the second "stage strip" was similarly treated, while the third "stage strip" was first mowed and then immediately sprayed at the same rates. On August 10, when the regrowth in the second ("bud strip") was in rosette stage, one half of each of the three "rate strips" was cultivated. On September 11, when the sprouts began to appear over the cultivated areas, one half of each "stage strip" was retreated at the three initial rates. In this manner the project was first broken into nine "rate-stage" units of 50 x 50 ft. Later, by cultivation and retreatment, each of these units had been further subdivided into four 25 x 25 ft. plots:

(1) T - - Initial Treatments ($1\frac{1}{2}$, 3, and 9 lb/A)
(2) TC - - Initial Treatment and Cultivation
(3) TR - - Initial Treatment and Retreatment
(4) TCR - - Initial Treatment, Cultivation and Retreatment

The degree of control was obtained as follows:

	1½ lb/A				3 lb/A				9 lb/A			
Treatments	T	TC	TR	TCR	T	TC	TR	TCR	T	TC	TR	TCR
	Percent regrowth											
Treated at rosette												
1954	50	33	61	20	33	12	39	27	12	16	11	15
1955	25	22	20	20	16	16	13	11	11	13	11	11
Treated at bud												
1954	37	18	14	14	14	7	10	8	19	12	7	9
1955	3	0	2	0	0	0	5	0	3	0	3	0
Mowed and treated at bud												
1954	53	50	50	42	49	22	17	13	60	25	18	27
1955	18	16	20	28	29	18	14	13	8	8	7	9

Of the three stages treated the bud stage treatments gave from 81% to 93% reduction in stands in 1954. In 1955 in seven treatments at this stage no shoots were recorded throughout entire season and in five treatments only from 2% to 5% stand was recorded in a form of small retarded rosettes. In the project as a whole there was a much greater difference in results between various stages than between the rates used. The rosette stage gave a very substantial reduction in stand at all rates, yet the degree of control could not be regarded as fully satisfactory even at the 9 lb/A rate. The mowing of top growth just prior to treatments at bud stage gave the least satisfactory results. Cultivation after the treated areas began to produce new shoots was consistently beneficial. (Contributed by Agricultural Division, American Chemical Paint Company, Saskatoon, Saskatchewan.)

Su

che
per
a 2
pot
Ami

tre
ure
ave
dic

Th
si
an
ph
sq
re
we
ma
of

Ab

of
(C
an
Po
pl
40
of
an
13
2,
of
Li
Ne

oc
ch
CM
19
Ma
Oc
se

FIELD BINDWEED

Summary

W. M. Phillips

The three abstracts submitted were concerned with soil applications of chemicals. In Nebraska, fall applications of 2,4-D amine at 20, 40, and 60 pounds per acre resulted in 41, 79, and 87 percent control respectively. DB Spray Powder, a 2,4-D-boron material, gave 59 and 93 percent control when applied at 320 and 640 pounds per acre. Amizol did not greatly reduce stands, while a combination of Amizol and 2,4-D thinned the bindweed stand 56 percent.

In Kansas, sodium chlorate at 640 pounds per acre (6 lbs./sq. rd.), Concentrated Borascu at 2560 pounds per acre (16 lbs./sq. rd.), and CMU and phenyldimethyl urea at 80 pounds per acre applied in different years resulted in nearly equal average bindweed control. Wide seasonal variation was noted but the differences did not seem to correlate with weather conditions.

Applications of several chemicals were made in Texas on July 29 and November 2. The fall treatments resulted in greater stand reductions. Amino triazol did not significantly reduce the number of bindweed plants. Formulations of 2,4-D, 2,4,5-T, and 2,4,5-trichlorophenoxy propionic acid, 2,4,5-T amide, SES, and 2,4,5-trichlorophenoxyethyl sulfate at 80 pound per acre, a 2,4-D-boron complex at 4 pounds per square rod, and Concentrated Borascu at 16 pounds per square rod gave significant reductions in stands when applied in the fall. Although differences among chemicals were, in general, not statistically significant, 2,4,5-T ester and the propionic materials appeared to give the best control of bindweed. SES was inferior to most of the other herbicides.

Abstracts

Control of field bindweed (Convolvulus arvensis) with soil applications of herbicides. Keyser, H. R. Quadruplicate square rod plots of field bindweed (Convolvulus arvensis) were sprayed November 9, 1954 with 2,4-D amine at 20, 40, and 60 lb/A; Amizol (3-amino-1,2,4-triazole) at 10, 20, and 40 lb/A; DB Spray Powder (7% 2,4-D and 59.5% B_2O_3) at 320 and 640 lb/A; and 2,4-D amine at 10 lb/A plus Amizol at 10 lb/A. All the chemicals were applied in water at the rate of 40 gal/A with the exception of DB Spray Powder which was applied dry. Estimates of per cent control were taken June 17, 1955. RESULTS: 2,4-D amine at 20, 40, and 60 lb/A gave 41, 79, and 87% control; Amizol at 10, 20, and 40 lb/A gave 13, 13, and 18% control; DB Spray Powder at 320 and 640 lb/A gave 59 and 93% control; 2,4-D amine at 10 lb/A plus Amizol at 10 lb/A gave 56% control. (Contribution of Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska and University of Nebraska Experiment Station, North Platte, Nebraska.)

Seasonal variation in results with soil sterilants for field bindweed control. Phillips, W. M. In connection with other soil sterilant studies sodium chlorate at 960 pounds per acre, Concentrated Borascu at 2560 pounds per acre and CMU at 80 pounds per acre were applied May 1952, May 1953, October 1953 and May 1954. Phenydimethyl urea at 80 pounds per acre was applied on all dates except May 1952. No retreatments were made. Counts of surviving plants were made in October 1955. CMU and phenydimethyl urea gave equal average results with little seasonal variation. Reduction in bindweed stand for the October 1953 treatments

ex
97
tr
me
Bo
in
fo
ap
re
Fo

lo
Se
195
Bo
exp
rep
ca
exc
to
use
2,4
7,7
(Te
2-(
2,4
bor
per
thi
fro
mer

exceeded 90% for all chemicals. Sodium chlorate applied May 1952 reduced the stand 97%, but a similar application in May 1953 gave only 68% reduction. The May 1952 treatment with CMU was not satisfactory with 55% reduction in stand, however treatments made in May 1953 and 1954 gave 93% and 94% stand decrease. Concentrated Borascu reduced the stand by 69% when applied in May 1952 and by 96% when applied in May 1953. Average reduction in the stand for the three chemicals applied on four dates was sodium chlorate-83%, Concentrated Borascu-85%, CMU-85%. It did not appear possible to correlate weather conditions following treatment with the results obtained. (Contribution from Field Crops Research Branch, ARS, USDA, and Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas.)

Field Bindweed (Convolvulus arvensis) control with heavy rates of translocated herbicides on Pullman silty clay loam. Wiese, Allen F. and Rea, H. E. Several translocated herbicides were applied on July 29 and again on November 2, 1954 at 0.5 pound per square rod along with a 2,4-D boron complex and Concentrated Borascu at 4 and 16 pounds per square rod, respectively. On each date, the experimental design was a randomized block with 3 replications. The data being reported were taken on September 9, 1955. The November application caused significantly more bindweed reduction than the July application. All of the chemicals except 3 amino-1, 2,4-trizole significantly lowered the number of weeds as compared to the checks which averaged 25.2 plants per square meter. The effective chemicals used and the average number of bindweed plants surviving per square meter were; 2,4-D amine (ethanol and isopropyl) 4.2, 2,4-D ester (propylene glycol butyl ether) 7.7, 2,4-D acid (emulsifiable) 9.7, 2,4,5-T amine (ethanol) 7.7, 2,4,5-T ester (Tetrahydrofurfuryl) 3.8, 2-(2,4,5-trichlorophenoxy) propionic acid (amine) 3.7, 2-(2,4,5-trichlorophenoxy) propionic acid (propylene glycol butyl ether ester) 2.7, 2,4,5-T amide 9.0, SES 13.0, 2,4,5-trichlorophenoxyethyl sulfate 9.8, 2,4-D and boron complex 9.2 and Concentrated Borascu 4.2. The LSD for herbicides at the 5 percent level was 7.1 plants per square meter. The rainfall during the period of this study was considerably less than the 18.3 inch annual average. (Contribution from the Amarillo Experiment Station, U.S.D.A. and the Texas Agricultural Experiment Station Cooperating.)

Sum

Neb
solu
ami
cent
trol
men
for

bud
cent
prac

Abst

Bush
bora
squa
were
loam
DB s
per
trat
Divi
Depa

bur
60 I
30 I
tome
of 4
2,4-
Amiz
lb/A
Nort
of M

este
at B
appl
ment
set
tres

Hoary Cresses and Bur Ragweed

Paul F. Sand

Summary

Five abstracts were received, three on bur ragweed and two on hoary cress. Nebraska reports good control of bur ragweed with 4 lb/sq rd of DB granular and DB soluble, sodium chlorate at 5 lb/sq rd and concentrated borascu at 12 lb/sq rd, 2,4-D amine applied to bur ragweed November 5, 1954 at 40 and 60 lb/A gave 89 and 95 per cent control and 2,4,5-T ester at 30 lb/A applied at this date gave 88 per cent control. June treatments at 1 and 2 lb/A of 2,4-D were more effective than July treatments and the ester's more effective than the amine salts. Treatment of bur ragweed for two years with 2 lb/A of ester in June has given 70 to 77 per cent control.

Pavlychenko reports that amizol applied to hoary cress at 6 and 12 lb/A at the bud stage and retreated at the same rates when regrowth occurred gave 99 to 100 per cent kill. Six lb/A of 2,4-D applied at the bud stage of hoary cress in 1954 gave practically no regrowth in 1955.

Abstracts Bur Ragweed

Effect of soil sterilant chemicals on bur ragweed (Franseria tomentosa). Bush, D. A. and Sand, P. F. DB granular and DB soluble at 4 lb/sq rd; concentrated borascu at 12 lb/sq rd; and sodium chlorate at 5 lb/sq rd were applied to triplicate square rod plots of bur ragweed on November 19, 1954 at Holdrege, Nebraska. The weeds were growing on Wabash silt loam, basin phase, a soil that ranges from a heavy silt loam to a silty clay loam. Estimates of per cent kill were made in August of 1955. DB soluble at 4 lb/sq rd gave 96 per cent control; DB granular at 4 lb/sq rd gave 96 per cent control; sodium chlorate at 5 lb/sq rd gave 99 per cent control; and concentrated borascu at 12 lb/sq rd gave 98 per cent control. (Contribution of the Division of Noxious Weeds, Nebraska Department of Agriculture and Inspection, and the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

The effect of soil applications of high rates of translocated herbicides on bur ragweed (Franseria tomentosa). Keyser, H. R. 2,4-D amine salt at 20, 40 and 60 lb/A; Amizol (3-amino-1,2,4-triazole) at 10, 20, and 40 lb/A; and 2,4,5-T ester at 30 lb/A were applied to quadruplicate square rod plots of bur ragweed (Franseria tomentosa) on November 5, 1954. All the chemicals were applied in water at the rate of 400 gal/A. Estimates of per cent control were made in August 1955. RESULTS: 2,4-D amine salt at 20, 40, and 60 lb/A gave 43, 89, and 95% control respectively; Amizol at 10, 20, and 40 lb/A gave 18, 36, and 64% control; and 2,4,5-T ester at 30 lb/A gave 88% control. (Contribution of University of Nebraska Experiment Station, North Platte, Nebraska and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska.)

Control of bur ragweed (Franseria tomentosa). Sand, P. F. 2,4-D isopropyl ester and amine salt were applied at 1 and 2 lb/A to replicated plots of bur ragweed at Holdrege, Nebraska at two dates starting in 1953. The first treatments were applied June 16, 1953 and these same plots retreated on June 30, 1954. Another treatment was applied on July 16, 1953 and these plots retreated on July 8, 1954 and one set of plots was treated on June 30, 1954. The following table shows results of the treatments in per cent kill of bur ragweed on June 22, 1955:

Treat
2,4-D

2,4-D

2,4-D

2,4-D
Cl

* One

The
effe
the
year
trib
HOAR

T.K.
Cres
(3-A
Four
abov
and
Seri
when
trea
TR.
peri
Seas
was
plot
in a
(Ser
gave
stag
at b
to l
the
resp
in a
by A

Pavl
Cres
3, 6
vola
was
were
trea
bud,

Per cent kill of bur ragweed 6-22-55

Treatment	Rate lb/a	Date treated 6-16-53 and 6-30-54	7-16-53 and 7-8-54	6-30-54
2,4-D amine	1	0	--	0
	2	38	13	0
2,4-D isopropyl ester	1	40	0	0
	2	70	20	55
2,4-D isooctyl ester	1	72	38	33
	2	77	59	62
2,4-D isoporpyl ester & Tergitol	2	--	58*	--
Check		0	0	0

* One treatment only, applied on July 8, 1954.

The June treatments were more effective than July treatments and the esters were more effective than the amine salt. The isooctyl ester appears to be more effective than the isopropyl ester at the one pound per acre rate. One treatment a year for two years has given somewhat better control than a single treatment for one year. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

HOARY CRESS

Effectiveness of Amizol in controlling Hoary Cress. 1954-5. Pavlychenko, T.K. A large and reasonably uniform infestation (7 to 256 plants, sq yd) of Hoary Cress (Cardaria draba) was selected in 1954 and treated at 3, 6 and 16 lbs/A of Amizol (3-Amino, 1, 2, 4-Triazole) in the advanced rosette, bud and "mowed at bud" stages. Four series of treatments were as follows: Series T,-the weed was treated once at the above rates and stages. Series TC-the weed was treated at the three rates and stages and cultivated, when the regrowth in plots treated in bud began to show regrowth. Series TR-the initial treatment was followed by retreatments at the same three rates, when the regrowth was in evidence over the cultivated areas. Series TCR-the initial treatment was followed by cultivation as in Series TC and retreatments as in Series TR. Permanent, replicated quadrats were established in every plot and counts taken periodically during 1954 and 1955 and expressed in terms of the original population. Season of 1954 was abnormally wet; in 1955 normal. RESULTS: In 1954 the top kill was slow, but complete at all three rates and stages. Regrowth also occurred in all plots of the four series. In late fall of 1954, the regrowth was especially plentiful in all series treated at the "mowed at bud" stage. In 1955 all single treatments (Series T) and where one cultivation was added to the initial treatments (Series TC) gave rather high pct. of regrowth and, with one exception, (TCR-12 lbs/A rosette stage), produced unsatisfactory weed control at all three stages, particularly "mowed at bud" stage. In series TR and TCR, at "bud" stage, 6 and 12 lbs/A rates produced 0 to less than 1% regrowth. At 3 lbs/A the regrowth was from 1 to 16%. Treatments at the rosette stage have resulted in somewhat higher regrowth: 3 to 7% at 6 and 12 lb/A respectively and up to 30% at the 3 lbs/A rate. At the "mowed at bud" stage, results in all four series were extremely erratic and generally unsatisfactory. (Contributed by Agricultural Division of American Chemical Paint Company, Saskatoon, Saskatchewan.)

Controlling Hoary Cress with 2,4-D straight acid and esters 1954-5. Pavlychenko, T. K. In a field badly infested (8 to 406 plants sq yd) with Hoary Cress (Cardaria draba), three blocks 150 x 150 ft. each were selected and treated at 3, 6 and 12 lbs/A rates of ACP638-straight acid of 2,4-D; ACP659-Butoxy ethanol, low volatile, ester at 2,4-D, and Ethyl ester at 2,4-Weedone concentrate, when the weed was in advanced rosette, bud and "mowed at bud" stages. Four series of treatments were established for each chemical at each rate and at each stage as follows: T - treated once; TC - treated once and cultivated when regrowth in the plots, treated at bud, began to appear; TR - treated once and retreated at the initial rates when

regr
in T
each
in t
1955
weed
grow
fest
and
four
in l
in b
equa
seri
top
more
in t
full
than
used
Sa k

regrowth was in evidence over the cultivated areas; TCR - treated and cultivated as in TC, and retreated as in TR. Permanent, replicated quadrats were established in each plot and counts taken periodically in 1954 and 1955. All records were expressed in terms of the original infestation. The season of 1954 was abnormally wet and in 1955 the moisture was normal. RESULTS: All three chemicals gave very high degree of weed control both at bud and rosette stages, while at "mowed at bud" stage the regrowth was generally very abundant and in some cases higher than the original infestation. Of the three chemicals ACP659 was the slowest in killing the top growth and the most consistent in reducing the amount of regrowth. The best results in all four stages were obtained at 6 lbs/A rates in bud stage, with practically no regrowth in 1955. The 3 and 12 lbs/A rates were highly effective, but some regrowth occurred in both 1954 and 1955. ACP638 was a quicker chemical in killing top growth, but was equally effective in the "bud" series TR and TCR at 6 lbs/A rates and in all four series at 12 lbs/A rates. Weedone concentrate was also rather quick in destroying top growth, but permitted more regrowth in most of the "bud" treatments and still more in the rosette stage. It produced highly significant control at all three rates in these two stages. Of the three rates, 6 lbs/A was most dependable; 3 lbs/A was not fully as effective as 6, but quite good; 12 lbs/A was equal or only slightly better than 6. Retreatments and cultivations were definitely beneficial with all the rates used. (Contributed by Agricultural Division of American Chemical Paint Company, Saskatoon, Saskatchewan.)

Leafy Spurge and Russian Knapweed

Summary

Lyle A. Derscheid

The use of normal amounts of 2,4-D for the control of leafy spurge or Russian knapweed has not been satisfactory except when several treatments have been applied over a period of a few years or when the chemical was used in conjunction with cultural weed control practices. The chief reasons for its effectiveness appeared to be a matter of penetration and translocation. Amine forms are not absorbed in lethal quantities. The ester forms penetrate the leaves but do not appear to be translocated to the roots. Attempts have been made to use other chemicals as additives in order to get better translocation. Limited trials with boron and 3-amino 1, 2, 4-triazole (amizol) as additives have been unsuccessful on leafy spurge.

However, one company has produced low volatile esters of several phenoxyactic acid compounds and an emulsifiable acid of 2,4-D in which another so called "translocator" is added. Several workers (Derscheid et. al., Helgeson, et. al., Pavlychenk and Sylwester et. al.) report that a low volatile ester of 2,4-D with this secret additive is more effective on leafy spurge than an emulsifiable acid of 2,4-D with the same additive or than the same low volatile ester without the additive. Derschei et. al. found, however, that low volatile esters of MCP and parachloro phenoxyacetic acid with the translocator were not as effective as an ester of 2,4-D without the additive.

Several workers reported unsatisfactory results with heavy rates of 2,4-D, however, none of them had applied the chemical during late fall. In South Dakota, 40 pounds of 2,4-D acid per acre applied after Oct. 1 to 10 has generally been very satisfactory. This is especially true if the area is cropped or retreated with light rates ($\frac{1}{2}$ to 1 lb.) of 2,4-D the next year.

Amizol (3-amino 1, 2, 4-Triazole) was used by several workers. A June application of 8 lb./A. gave 99% elimination of leafy spurge in South Dakota. Six pounds applied in July was sufficient at Scott, Saskatchewan. Fifteen lb. (the lowest rate tried) applied in June was effective in Alberta. However, 16 lb./A. applied in July only gave 73% elimination at Regina, Sask. and a July 1955 application of 10 lb./A. only gave 50% kill by September, in Iowa. Pavlychenko obtained better results with amizol applied at the bud stage than at the rosette stage of growth. Cultivation one month after treatment increased the effectiveness of the chemical. A fall application of as much as 12 lb./A. was ineffective on Russian knapweed. Rates as low as 2 lb./A. killed established stands of grass indicating that amizol could best be used on leafy spurge as a soil sterilant.

In one experiment, amizol was applied as a foliage spray before the area was plowed and planted to corn. In another, the chemical was applied during the fall and plowed 2 weeks later and planted to oats the next spring. Crops were not injured in either case and rates of 4 lb./A. held the spurge in check until July and prevented seed production for the year. A follow up treatment of 2,4-D or cultivation may have given considerable elimination.

In one experiment, summer and fall applications of 20, 30 and 40 lb./A. of 2 (2, 4, 5-Trichlorophenoxy) propionic acid (Silvex) gave complete elimination of leafy spurge indicating that heavy rates of this chemical may be more reliable than heavy rates of 2,4-D.

TCB (2, 3, 6-Trichlorobenzoic acid) applied at rates of 2 or 4 lb./A. to leafy spurge foliage that was plowed 10 days later and planted to corn gave a 75% kill and left the remaining plants in a stunted condition without producing seeds 4 months later. It did not injure the corn. Higher rates were less effective on the weeds. TCB applied at the rate of 4 lb./A. on Russian knapweed gave a marked reduction in stand of weeds and did not affect bromegrass sod.

Several workers used soil sterilants. Leafy spurge was practically eliminated in most cases by the application Concentrated borascu 10 lb./sq. rd., Polybor 10 lb./sq. rd., sodium chlorate 4 - 5 lb./sq. rd., Polybor-chlorate 10 lb./sq. rd., chlorax 5 - 10 lb./sq. rd., ammonium sulfamate 5 - 8 lb./sq. rd. and borate-2,4-D mixtures 5 - 6 lb./sq. rd. In most cases CMU was ineffective, but one experiment obtained a 97% kill with 100 lb./A.

Russian knapweed was almost completely eliminated with sodium chlorate 5 lb./sq. rd., borate-chlorate mixtures 10 lb./sq. rd. straight boron compounds 15 lb./sq. rd., ammonium sulfamate 5 lb./sq. rd., borate-2,4-D mixtures 5 lb./sq. rd. and Chlorax 2 - 3 lb./sq. rd., CMU and its analogs were ineffective at rates up to ½ lb./sq. rd.

At these rates the quickest top kill and shortest period of residual toxicity was obtained by borate-2,4-D mixtures and ammonium sulfamate followed in order by sodium chlorate, borate-chlorate mixtures, the straight boron compounds and CMU. Grasses in which the weeds are treated seem to be affected least, by the borate-2,4-D mixtures followed in order by the straight boron compounds, ammate, and borate-chlorate mixtures. CMU and chlorate almost always killed the grass.

Abstracts

Further observations of DB powder, DB granular and ammonium sulfamate for the control of leafy spurge (Euphorbia esula) Craig, H. A., Wood, H. E., Fraser, D. D., Watson, D. W. In spring and fall, 1954 and midsummer 1955 at Rossendale, Manitoba, several soil sterilant chemicals were applied to moderately heavy infestations of leafy spurge in native grass on light loam soil. Inspection of the 1954 treated plots made late in 1955 revealed complete eradication of spurge by DB powder and DB granular at 8 lbs./sq. rd.; over 98% eradication by both chemicals at 6 lbs., and only slightly less control at 4 lbs. The grass remained unharmed. Ammonium sulfamate at 8 lbs./sq. rd. gave 90% control. Atlacide, polybor chlorate and polybor were less satisfactory. (Contributed by Weeds Commission, Manitoba Department of Agriculture and Immigration)

Effect of borax compounds on persistent perennials. Coupland, R. T. and S. Zilke. Numerous applications of borax compounds have been made to well-established stands of leafy spurge (Euphorbia esula) and toadflax (Linaria vulgaris) in competition with grass on sandy soils near Saskatoon. Applications of Polybor Chlorate (73% borates, 25% sodium chlorate) in Sept., 1953 and May, 1954 at 2 and 3 lb. per 100 sq. ft. provided 70 to 100 (ave. 94.8) per cent control of these weeds in Sept., 1955 in five tests, while in a sixth (on toadflax) no effect of the herbicide remained. Rates of ½ to 1½ lb. gave similar results where tried, while the 4-lb. rate caused no apparent increased damage to the weeds. Concentrated borascu (61.5% B_2O_3) under the same conditions at 4 to 6 lb. per 100 sq. ft. gave 99.7 to 100 per cent

co
Po
Lo
ra
(4
tr
mo
Sc
pa

an
les
lb.
al
fir
(Di

spi
hav
Sev
(½
The
lea
sod
sq.
DB
fal
CMU

by
and

ula
asc

the
afte
Poly
has
resi
Spun
afte

quic
idus
borc
Stat

control in the first five tests, and 90 to 97 per cent control where no effect of Polybor chlorate remained after a period of two growing seasons following treatment. Lower rates (down to 1 lb.) were equally effective when following treatment. Lower rates (down to 1 lb.) were equally effective when used. Complexes of sodium borate (41 and 60%) and 2,4-D (7%) applied in May, 1954 at 1 to 3 lb. per 100 sq. ft. control of these weeds in all four tests. The Polybor Chlorate affected grass growth most, while only heavy rates of the other three herbicides damaged grass appreciably. Seedlings have appeared but have not as yet survided. (Contribution from the Department of Ecology, University of Saskatchewan, Saskatoon).

Comparison of various chemicals for control of leafy spurge. Corns, Wm. G. and Wm. Vanden Born. The following treatments were applied to small patches of leafy spurge on June 16: Sodium chlorate, 4 lb./100 sq. ft.; 2,4-D ester 40, 122, lb./acre; CMU, 50 lb./acre; DB granular 4 lb./100 sq. ft.; amino triazole 15 lb./acre; all except DB were sprayed on. All treatments killed top growth of spurge observed finally in late September. 2,4-D and DB granular were not fatal to associated grass. (Division of Crop Ecology, Dept. Plant Science, University of Alberta).

Comparison of soil sterilants for use in eliminating small patches of leafy spurge Derscheid, Lyle A., Wallace, Keith E., and Nash, Russel L. Six experiments have been conducted since 1950 - 3 of them were applied in July and 3 in September. Several rates of several soil sterilants were applied to duplicate 9-ft. x 15-ft. (½ sq. rd.) plots of leafy spurge growing in a bromegrass sod in each experiment. The results show that the following treatments generally kill 95% to 99% of the leafy spurge; Conc. borascu 10 lb./sq. rd., Polybor 10 lb./sq. rd., chlorate of soda 5 lb./sq. rd., borate-chlorate mixtures (Chlorax or Polybor-chlorate) 10 lb./sq. rd., ammonium sulfamate 5 lb./sq. rd. and borate-2,4-D mixtures (DB Spray and DB Granular applied in 2 experiments only) at 5 lb./sq. rd. when applied in the fall. The compounds containing chlorate or ammate were not as dependable in July. CMU at rates of ½ lb./sq. rd. or less was not satisfactory.

At these rates bromegrass sod was injured the least by DB-Granular, followed by Conc. borascu, Polybor, and Ammate. The borate-chlorate mixtures, chlorate, CMU and DB Spray killed practically all of the grass.

Ammate and DB Spray gave the quickest top kill followed in order by DB Granular, sodium chlorate, Polybor-chlorate and Chlorax, Polybor and Concentrated borascu.

Small grain was seeded on all plots the second year after treatment to check the length of residual toxicity. Small grain does not grow on CMU plots 4 years after treatment even though the spurge flourishes. Likewise, the Polybor and Polybor-chlorate plots do not produce a crop 4 years after treatment, and the spurge has not come back. However, Kochia and Russian thistle produce rank growths. The residual toxicity of all other chemicals seems to disappear in 3 years or less. Spurge regrowth appears on plots treated with the borate-2,4-D mixtures one year after treatment and on Ammate plots in less than two years.

The length of residual toxicity appears to be directly correlated with the quickness of top kill. The borate-2,4-D mixtures and Ammate have the shortest residual effect, followed by sodium chlorate, the borate-chlorate mixtures, the straight boron compounds and CMU. (Contributed by the Agronomy Department, South Dakota State College, College Station, Brookings, S. Dak.).

Early spring treatments with amizol and TCB for the control of leafy spurge. Derscheid, Lyle A. and Nash, Russel L. Duplicate 1-rd. by 3-rd. plots of leafy spurge were treated with 3-amino 1,2,4, triazole (amizol) and the sodium salt of 2,3,6-Trichlorobenzoic acid (TCB) on May 17, 1955, before the upper bracts had started to turn yellow. Amizol was applied at rates of 2 and 4 lb./A., while TCB was applied at 2, 4, 6 and 8 lb./A. Each rate was applied at volumes of 10 gal./A. and 40 gal./A. On May 26 all plots were plowed and planted to corn which was cultivated three times during the growing season. Amizol held the weeds in check until the middle of July. After this time they lost chloratic appearance and seemed to outgrow the effect of the chemical. However, they had not produced seed by Sept. 1. The two higher rates of TCB had very little effect on the weeds, but the 2 and 4 lb./A. rates appeared to thin the stand by about 75%. The remaining plants were only 4 to 6 inches tall on September 15 (4 months after treatment). Corn yields were taken on October 1st. Yields on plots treated with 40 gal./A. volume were 4 to 9 bushels lower than plots treated with same chemical treatment in 10 gal./A. volume. Plots treated with amizol at rates of 2 and 4 lb./A. in 10 gal./A. yielded 54.6 and 55.2 bu./A. while plots treated with TCB at rates of 2, 4 and 6 lb./A. in 10 gal./A. yielded 55.1, 59.6, and 48.4 bu./A. These results indicate that it may be possible to eliminate leafy spurge by treatment with amizol or TCB before plowing for corn--neither chemical appeared to hurt the corn. The higher rates of TCB apparently killed the tops but were not translocated to the roots. Further experimentation is needed before any recommendations can be made. It is possible that a light dose of 2,4-D in the corn about lay-by time would improve the results. (Contributed by the Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota).

Amizol and Silvex and heavy rates of 2,4-D for elimination of leafy spurge. Derscheid, Lyle A. and Nash, Russel L. Duplicate 1-rd. by 3-rd. plots of leafy spurge growing in a bromegrass sod, were treated June 9, 1954, shortly after the upper bracts had turned yellow with 3 amino 1,2,4-Triazole (amizol) at rates of 2, 4, 8 and 16 lb./A., with an amine of 2 (2,4,5-Trichlorophenoxy) propionic acid (Silvex), at rates of 20, 30, and 40 lb./A. On September 15, 1954, other plots were treated with Silvex at rates of 20, 30, and 40 lb./A. and with a 2,4-D amine at the same rates. The Silvex and 2,4-D were applied in 10 gallons of spray per acre, while amizol was applied in 40 gallons per acre. Plant counts of 4 sq. yds. of each plot on May 14, 1955, revealed that all Silvex treatments had killed 93 to 99% of the spurge with little injury to the bromegrass. Amizol at rates of 2 and 4 lb./A. eliminated 74 and 58% of the spurge, but the rates of 8 and 16 lb./A. gave a 99% kill. All rates of amizol injured the bromegrass with the higher rates reducing the stand over 75%. The best 2,4-D treatment was the 40 lb./A. rate applied in September it eliminated 75% of the leafy spurge and reduced the stand of bromegrass by 25%. These preliminary results indicate that amizol may be used like a soil sterilant to eliminate leafy spurge and that heavy rates of Silvex may be more reliable than heavy rates of 2,4-D. (Contributed by the Agronomy Department of South Dakota State College, College Station, Brookings, South Dakota).

The effect of 2,4-D, MCP and para with an added translocator on leafy spurge when applied in 3 different volumes of carrier. Derscheid, Lyle A. and Nash, Russel L. Triplicate 1-rd. x 3-rd. plots of leafy spurge growing in a bromegrass sod were treated in 1954 with five chemicals (1) butoxy ethanol ester of 2,4-D, (2) butoxyethanol ester of 2,4-D with a translocator added, (3) emulsifiable acid of 2,4-D with a translocator added, (4) butoxyethanol ester of MCP with a translocator added, and (5) butoxyethanol ester of para-chlorophenoxyacetic acid with a translocator added. Each chemical was applied May 28 before upper bracts of spurge had turned yellow at rates of ½ lb./A. and 1 lb./A. Four of the plots

treated with ½ lb./A. were retreated September 15 with 0, ½, 1 and 2 lb./A. These treatments were applied in volumes of 10 gal./A. and 40 gal/A. Three of the plots treated with 1 lb./A. in May were retreated with 0, 1 and 2 lb./A. rates in September These treatments were applied in volumes of 10 gal./A., 40 gal./A. and 80 gal./A. There were 17 treatments and 1 untreated plot for each chemical in each replicate. On May 14, 1955, leafy spurge counts were made on 4 sq. yds. of each plot to determine the percentage of kill. The 2,4-D formulations were much superior to the other chemicals and there was no difference among volume of spray solution per acre. The best kill was obtained on plots treated in May and again in September--there was little difference among rates of application however, the plots treated with 1 lb./A. in May averaged about 5% better kill than plots treated with ½ lb./A. The butoxyethanol ester with a translocator added averaged about 15% better than the emulsified acid with a translocator added and about 25% better than the butoxyethanol ester without the additive. The best kills were between 85% and 90%.

Twenty-four of the best treatments (8 of each 2,4-D formulation) were applied to leafy spurge growing in Mo-0-205 oats in 1955. Spring treatments of ½ lb./A. and 1 lb./A. were applied June 2 when oats were starting to head. Fall applications of ½ lb./A. and 1 lb./A. and 2 lb./A. were applied in the stubble. Oat yields were between 50 and 60 bu./A. indicating that neither rate of either chemical reduced the yield of the crop. These results indicate that 2,4-D is superior to similar formulations of MCP and para and that better kills of leafy spurge may be obtained if some way is devised (perhaps the addition of a translocator compound) to get the 2,4-D translocated to the roots. (Contribution of the Agronomy Department, South Dakota State College, College Station, Brookings, South Dakota.)

Effect of various chemicals on the control of leafy spurge. Forsberg, D. E. On July 18th, 1955, a series of square rod plots, on a solid stand of leafy spurge were top sprayed at the flowering stage. The following herbicides were used, 2,4-DE at 3 and 6 and 12 lbs. acid equivalent/A., Amizol at 6 and 12 lbs. acid equivalent/A, ACP-L-889 at 3 and 4 lbs. of acid equivalent/A., and a combination of 2,4-DE and Amizol at 6 and 1,6 and 3, and 6 and 6 lbs. of acid equivalent/A.
Results- In September a 100% top kill was noted on all plots. However, the plots receiving straight Amizol and ACP-L-889 appear slower reacting in that a few seeds had been formed on these plots. Plots receiving 3 and 6 lbs. of 2,4-DE had approximately 15% regrowth, whereas the plot receiving 12 lbs. of 2,4-DE has no regrowth, but new buds were being formed on the roots lower down. These new buds showed some indication of chemical effects. The addition of Amizol to 2,4-D did not appear to have any greater effect on the roots than straight 2,4-DE. Amizol alone did not have any appreciable effect on the roots, however, the regrowth was still showing some effects of the chemical. Although the ACP-L-889 appear slow in its effect on the plants the roots of the plants were badly distorted and twisted by this chemical. The final results of this test will not be known until 1956. (Contribution by the Experimental Farm, Scott., Sask.).

Fall, pre-plowing treatment of leafy spurge (Euphorbia esula) with Amizol (3-amino,2,3,4-triazole). Helgeson, E. A. and Melander, L. W. On September 1, 1954, one acre of land heavily infested with leafy spurge was sprayed with 4 pounds of amizol in 10 gallons of water. Two permanent quadrats 10 feet square were established in different parts of the acre-plot. Counts were made of the leafy spurge plants in each quadrat at time of treatment. The land was plowed two weeks after treatment. In May 1955, this land was planted to oats, which were swathed for harvest, July 17, 1955. On June 15, 1955, observations showed that most of the regrowth of spurge was etiolated in appearance and appeared to have a survival of only short duration. However, when the final notes were taken

on J
cati
with
rat

Quad

with
matu
peri
Ambl

and
appl
dras
Dako
2,4-
2,4-
(Wee
plot
cent
At e
tion
quad
as i

For

Emul
But
But
2,4

2,4
ahg
of
Chem

var
wer
a p
bor
qua
app
The

on July 19, 1955, most of the regrowth was green but short and spindly with indications that few spurge stems had produced seed. This was in direct comparison with untreated plots where numerous plants had produced seed. The permanent quadrat plow counts were as follows:

Quadrat Number	Count Sept. 2, 1954	Count July 19, 1955	% Reduction
1	146	39	74%
2	736	260	65%

These results would indicate that fall pre-plowing treatment of leafy spurge with amino triazole reduces the infestation sufficiently to enable the oats to mature without competition from this weed. (Contributed by the North Dakota Experiment Station, Fargo, in cooperation with the American Chemical Paint Company, Ambler, Pa.).

The effect of four formulations of 2,4-D on leafy spurge. Helgeson, E. A. and Nelander, L. W. Of four formulations of 2,4-dichlorophenoxy acetic acid, applied as a high volume spray to leafy spurge, *Euphorbia esula*, three formulations drastically reduced the original stand of this perennial in one season in North Dakota. On June 3, 1954, and again on September 1, 1954, four formulations of 2,4-D, (1) an emulsified acid formulation (ACP-L-638), (2) butoxy ethanol ester of 2,4-D (ACP-L-4), (3) butoxy ethanol ester (ACP-L-659) and (4) an amine of 2,4-D (Weedar 64), were applied as foliage sprays, with a high gallonage sprayer to plots of leafy spurge, approximately one rod wide and 16 rods long, using concentrations of one and two pounds acid equivalent in 100 gallons of water mixture. At each treatment a rate of 150 gallons per acre was used, giving a total application of 3 and 6 pounds per acre, respectively. The final counts of the permanent quadrats were made about one year after treatment, June 14, 1955. The results are as follows:

Formulation	Percent reduction in original stand	
	1 pound ahg	2 pounds ahg
Emulsified acid of 2,4-D	61%	88%
Butoxy ethanol ester of 2,4-D	66%	85%
Butoxy ethanol ester 2,4-D (L659)	73%	80%
2,4-D amine	61%	63%

From the above it will be noted that the butoxy ethanol ester (L-659) of 2,4-D was the most effective at one pound ahg and the emulsified acid at 2 pounds ahg. The 2,4-D amine was least effective at both concentrations. (Contributions of the North Dakota Agricultural Experiment Station, Fargo, and the American Chemical Paint Company, Ambler, Pa. cooperating.).

Chemicals for leafy spurge Molberg, E. S. Six chemicals were applied at various rates to square rod plots of leafy spurge in July, 1954. The chemicals used were 3, Amino 1,2,4-triazole (Amizol), Disodium octaborate tetrahydrate (polybor), a polybor, 2,4-D mixture, 2,4-D, a Disodium tetraborate pentahydrate, Disodium tetraborate decahydrate mixture (DB granular), and CMU. The treatments were made in quadruplicate. The following are the treatments given and the percent kill as it appeared in September, 1955. The rates shown are lbs./A. of active ingredient. They are listed in order of their effectiveness. 100 lb. CMU 96.8%, 16 lb. amizol

72.8
640
foll
plus
by t

On J
stal
stri
simi
"rat
Sept
each
each

In e
take
foll

Tros

Rosc

Bud

Mowe

None
icat
The
stag
Agri

Spur
with
divi
was
ac.
"sta

72.8%, 960 lb. DB-granular 61.2%, 480 lb. DB-granular 31.2%, 6 lb. amizol 21.8%, 640 lb. polybor 18.8%, 3 lb. amizol 8%, 10 lb. CMU 5%, 50 lb. 2,4-D 0.5%. The following treatments showed no reduction in stand: 320 lb. polybor, 4.5 lb. polybor plus 5 lb. 2,4-D, 5 lb. 2,4-D 25 lb. 2,4-D and 160 lb. DB-granular (Contributed by the Experimental Farm, Regina, Sask.).

Effect of Amizol on Leafy Spurge in pasture, 1954-5. Pavlychenko, T. K. On June 17, 1954, a piece of old, dense infestation of Leafy Spurge (130 to 140 stalks sq. yd.) 150 x 150 ft. in size, was divided into three 50 x 150 ft. "rate" strips (3, 6 and 16 lbs./A.). The same area was also divided crosswise into three similar "state" strips (rosette, bud and mowed at bud). This gave nine 50 x 50 ft. "rate-stage" began to appear, one-half of each "rate" strip was cultivated, and on Sept. 14, when the regrowth over the cultivated areas was observed, one-half of each of the three "stage" strips were retreated at the initial rates. In this way each of the 9 "rate-stage" units was further broken into four treatments:

T ———————— Treated once
TC ———————— Treated and Cultivated
TR ———————— Treated and Retreated
TCR ———————— Treated, Cultivated and Retreated

In each treatment permanent, replicated quadrats were established and counts taken periodically in 1954 and 1955. The final records for the seasons were as follows: (In terms of original population).

	3 lbs./A.				6 lbs./A.				16 lbs./A.			
	% reduction in stand				% reduction in stand				% reduction in stand			
Treatments	T	TC	TR	TCR	T	TC	TR	TCR	T	TC	TR	TCR
Rosette stage												
1954	72	80	81	82	74	83	81	90	88	92	90	93
1955	70	75	75	78	81	88	85	93	85	89	85	94
Bud stage												
1954	85	89	87	94	89	95	95	97	95	97	96	99
1955	80	86	85	89	85	93	92	97	93	95	95	98
Mowed at bud												
1954	61	66	58	68	67	78	69	78	61	70	69	78
1955	50	63	54	70	58	66	67	69	52	57	56	67

None of the four treatments at the three stages and three rates gave a complete eradication. All four treatments at the "mowed-bud" stage gave consistently poor results. The "bud" stage was the best at all three rates, especially at 16 lb./A. The "rosette stage also gave satisfactory control at the two higher rates. (Contributed by Agricultural Division of American Chemical Paint Company, Saskatoon, Saskatchewan).

A comparative study of effectiveness of 2,4-D as acid and esters on Leafy Spurge in pasture, 1954-5. Pavlychenko, T. K. In old pasture, uniformly infested with Leafy Spurge (130 to 150 plants per sq. yd.), one block of the infestation was divided longthwise into three, 50 ft., "rate" strips. On June 17, when the weed was in rosette stage, the first "stage" strip was treated at 3, 6 and 12 lbs./A., ac. eq. of straight 2,4-D acid. On July 14, when the weed was in bud, the 2nd "stage" strip was similarly treated. On the same day the 3rd "stage" strip was

mow
at
Sop
eac
fin

In
Eth
eac
on
At
659
orig
at
of
sta
Of
lbs
chem
(Gen
Sask

esul
loam
(DE
and
R. A
sprin
Brom
count
20,
Resul
shoot
grass
sligh
on pl
ascu
Concr
grass
sodiu
spurg

Bakke
Iowa
man C
per s
lbs.
acre,

mowed and treated at the three rates. On Aug. 10, when regrowth in the plots treated at "bud" stage began to appear, one-half of each "rate" strip was cultivated. On Sept. 13, when the regrowth over the cultivated areas was in evidence, one-half of each "stage" strip was retreated. By all these operations, the entire block was finally subdivided into four treatments, at each rate, and at each stage, as follows:

T———————— Treated once
TC———————— Treated and Cultivated
TR———————— Treated and Retreated
TCR———————— Treated, Cultivated and Retreated

In another identical two blocks, exactly the same procedure was followed, but Butoxy Ethanol and Ethyl esters were used respectively instead of straight 2,4-D acid. In each treatment, permanent, replicated quadrats were established and periodical counts on regrowth taken, and always expressed in terms of the original population. RESULTS: At "rosette" stage the three materials used (2,4-D acid, Butoxy Ethanol ester - ACP 659; and Ethyl ester - Weedone Concentrate), considered as a group, have reduced the original stand by the minimum of 73 and maximum of 90 pct. at 3 lbs./A; 78 and 93 pct. at 6 lbs./A; and 69 to 91 pct. at 12 lbs./A. rates. This was a reasonably high degree of weed control. In "bud" stage the results were much better, with the reductions in stand at the corresponding rates being 81 - 96; 83 - 98; and 39 - 98 respectively. Of the three chemicals, ACP 659 gave somewhat higher reductions, especially at 6 lbs./A. rate in "bud" stage. When applied on weeds mowed at "bud" stage, all three chemicals produced unsatisfactory results with plentiful and healthy regrowth. (Contributed by Agricultural Division of American Chemical Paint Company, Saskatoon, Saskatchewan).

Effect of spring application of selected sterilants on leafy spurge (Euphorbia esula). Sexsmith, J. J. Duplicate square rod plots, on heavily spurge infested loam near Calgary, Alta., were treated on May 10, 1955, with borate - 2,4-D mixtures (DB Granular and DB Spray), Polybor-Chlorate; and sodium chlorate at 2 lb./100 sq. ft. and Conc. Borascu at 3 lb./100 sq. ft. Treatments were applied in cooperation with R. A. Harvey, Pacific Coast Borax Co. The area had been burned over earlier in the spring, and on May 10 shoots of spurge and mixed grasses (including Agropyron smithii, Bromus inermis, Poa secunda, and Festuca idahoenisis) were just emerging. Shoot counts of the leafy spurge were taken immediately before treatment and again on July 20, and notes were taken several times throughout season up to the last visit on Oct. 13. Results: Both DB Granular and DB Spray caused stunting of early shoot growth, all shoots were dead by July 20, and no further spurge had appeared by October 13. The grasses grew well throughout the season, the only effect of the DB treatments being a slight delay in development. Spurge stands on July 20 were reduced to approx. 25% on plots treated with sodium chlorate and Polybor-Chlorate, and to 15% by Concn. Borascu. The same relative degree of control persisted until the end of the season. Concn. Borascu had very little effect on the grasses, whereas some kill of the bunch grasses by Polybor-Chlorate was noted, and almost complete kill of all grasses by sodium chlorate was evident by mid-October. All treatments gave complete control of spurge seedlings. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta)

The effect of various herbicides on leafy spurge. Sylwester, E. P. and Bakke, A. L. Heavy stand of leafy spurge - Euphorbia esula growing near Manchester, Iowa in the northeastern part of the state was treated on July 2, 1954, with (1) Chipman Chlorax 5 lbs. per sq. rod, (2) Borascu 25 lbs. per sq. rod, (3) Polybor 15 lbs. per sq. rod, (4) Atlacide 2,4-D (Chipman mixture), 5 lbs. per sq. rod, (5) Ammate 3 lbs. per sq. rod, (6) Karmex (CMU 40 lbs. per acre,) (7) Amino triazole 10 lbs. per acre, (8) Dow Esteron Brush killer 2 lbs. per acre, (9) Dow Kuron 2 lbs. per acre,

(10) 2,4-D (Weedone LV) 2 lbs. per acre, (11) Dalapon 10 lbs. per acre, (12) Weedone 638, 2 lbs. per acre, (13) 2,4-D Weedone ACP-L-659, 2 lbs. per acre, (14) ACP-L-674, 2 lbs. per acre. Early in June 1955, the entire area was sprayed with 2,4-D. On June 23, 1955, the results were as follows: (1) 99 percent kill, (2) 90 percent kill (scattered plants), (3) 98 percent kill, (4) 99 percent kill, heavy stand blue grass, (5) Practically 100 percent kill, heavy stand bluegrass, (6) No control of leafy spurge, (7) 50 percent reduction in stand leafy spurge, good stand of bluegrass, (8) 70 percent control, good stand bluegrass, (9) 50 percent control, (10) 85 percent control, (11) Little effect on leafy spurge and bluegrass, (12) Little effect on spurge or grass, (13) 95 percent control, no effect on milk weed, no effect on grass, (14) 90 percent control, no effect on blue grass.

On October 4, 1955, the results were as follows: (1) Chlorax - all spurge killed, heavy stand of bluegrass, (2) Borascu - 15 spurge plants, good stand bluegrass (3) Polybor - 4 small spurge plants, heavy stand bluegrass, (4) Atlacide 2,4-D mixture 2 spurge plants, good stand of bluegrass, (5) Ammate - 6 spurge plants, good stand bluegrass, (6) CMU - no control of spurge; bluegrass killed; canary grass killed, (7) Amino triazole - 50 percent reduction in leafy spurge, spurge stunted, good stand bluegrass, (8) Esteron brush killer - 85 percent control spurge, good stand bluegrass, (9) 80 percent contol, good stand of bluegrass, (10) 2,4-D LV - 90 percent control; good bluegrass, (11) Dalapon - little effect on bluegrass and spurge, little effect on blue stem grass, (12) Weedone 638 -(Emulsified acid 2,4-D) - 95 percent control, no effect on grass, (13) ACP 659 (Emulsified Acid-2,4-D) - 95 percent control no effect on bluegrass, (14) ACP-L-674 (Emulsified Acid-2,4-D) - 90 percent control spurge. Spurge plants small. The plots were again treated on Oct. 4, with the same material unless entirely free of leafy spurge. No. 6 was treated with Borax 2,4-D mixture; No. 8 - Ureaborate; No. 9 - Esteron brush killer; No. 10 - Dow Kuron, 11 Urea borate. (Iowa Agricultural Extension Service, Iowa Agricultural Experiment Station, Ames, Iowa

Russian Knapweed

Comparison of soil sterilants for the use in eliminating small patches of Russian knapweed. Derscheid, Lyle A., Wallace, Keith E., and Nash, Russel L. Four experiments have been conducted since 1952 - 2 were applied in July and 2 in September. Several rates of several soil sterilants were applied to duplicate 9-ft. x 15-ft. ($\frac{1}{2}$ sq. rd.) plots of Russian knapweed growing in crested wheatgrass sod in each experiment. The results indicate that the following treatments generally kill 95% to 99% of the knapweed: chlorate of soda 5 lb./sq. rd., borate-chlorate mixtures (Chlorax and Polybor-chlorate) 10 lb./sq. rd., Conc. borascu 15 lb./sq. rd., Polybor 15 lb./sq. rd., ammonium sulfamate 5 lb./sq. rd. and borate-2,4-D mixtures (DB Granular and DB Spray in 2 experiments only) at 5 lb./sq. rd. CMU and its analogs were not effective at rates up to $\frac{1}{2}$ lb./sq. rd. except when the plots became inundated after a heavy rain. The chlorate containing compounds were more consistently effective than the other chemicals.

At these rates, the crested wheatgrass sod was injured the least by DB-Granular followed by Conc. borascu, Polybor and Ammate. The borate-chlorate mixutures, sodium chlorate, DB Spray and CMU and its analogs killed practically all of the grass.

Ammate and DB Spray gave the quickest top kill followed in order by DB Granular, sodium chlorate, the borate-chlorate mixtures, Polybor and Conc. borascu.

The experiments treated in Sept. 1952 and July 1953 were plowed and seeded to oats in 1955 to check the comparative residual toxicity. The residual effect of Conc. borascu and CMU was strong enough to prevent crop growth, but the residual effect of

Poly
The
regr
Sout

Ders
knap
2,4-
emul
amin
appl
and
of c
of k
gras
The
All
Lowe
fall
and
than
othe
had
Agro

E. V
divi
on s
and
appl
resu
tile
DB S
appl
slow
plot
this
the
40 l
and
ACP-
resu
whit
10 l
brom

Polybor, chlorate, ammate and the borate-chlorate mixtures had disappeared in 2 years. The borate-2,4-D mixtures appear to have the shortest residual toxicity as knapweed regrowth appears 1 year after treatment. (Contributed by the Agronomy Department, South Dakota State College. College Station, Brookings, South Dakota).

Amizol and heavy rates of 2,4-D for the elimination of Russian Knapweed Derscheid, Lyle A. and Nash, Russel L. Duplicate 1-rd. by 3-rd. plots of Russian knapweed growing in a crested wheatgrass sod were treated on Sept. 21, 1954, with 2,4-D amine at rates of 10, 20, 30 and 40 lb./A., 2,4-D ester at 20 and 30 lbs./A, emulsifiable acid of 2,4-D with a translocator added at 10, 20, 30 lb./A. and 3 amino 1,2,4-Triazole (Amizol) at 4, 8 and 12 lb./A. The 2,4-D amine and ester were applied in 10 gal./A. volumes of spray, the emulsifiable acid of 2,4-D in 40 gal./A. and the amizol at the rate of 4 lb. in 10 gal. Weed counts were made on 4 sq. yds. of each plot before treating and again on May 23, 1955, to determine the percentage of kill. 40 lb./A. of 2,4-D amine gave 75% kill of weeds and reduced the stand of grass 10%. 30 lb./A. of 2,4-D ester killed 70% of the weeds and 10% of the grass. The highest rate of the emulsifiable ester killed 83% of the weeds and 85% of the grass. All rates of amizol gave zero control of weeds and 95 to 100% kill of the grass. Lower rates of the other chemicals killed fewer weeds. These results indicate that fall application of as much as 12 lb./A. of amizol is ineffective on Russian knapweed and that the emulsifiable acid of 2,4-D with a translocator added is somewhat better than the regular forms of 2,4-D when applied at heavy rates in September. Based on other results, it is probable that the 2,4-D treatments would have been better if they had been applied 2 weeks to a month later in the season. (Contribution of the Agronomy Department, South Dakota State College, College Station, Brookings S. Dak.).

The effect of herbicides on Russian knapweed (Centaurea repens). McCurdy, E. V. A small field of Russian knapweed growing in competition with bromegrass was divided into replicated plots 10 feet square. During the past four years the stand on some plots has been thinned with repeated applications of esters of 2,4-D, MCP and a mixture of 2,4-D and 2,4,5-T at 2 lb./A. but not to the extent to have practical application. An ester of 2,4-D was applied at 32 lb./A. in the summer of 1954. The results were quite erratic and considerable regrowth appeared this year. A low volatile ester (LV-4) used in 1955 reduced the number of plants from 132 to 45 per plot. DB Spray powder at 1 and 2 lb./100 sq. ft. almost eradicated this weed. DB Granular applied as a powder at the same rate was not as effective but the action may be slower. Polybor chlorate at 1 lb./plot thinned the stand but a rate up to 2½ lb./plot was required to give control. Chlorea at 2 and 3 lb./plot killed all growth this year. Karmex DW at 20 and 40 lb./A. severely injured the bromegrass but by fall the number of plants of Russian knapweed had increased at both rates. CMU at 20 and 40 lb./A. applied in 1954 resulted in the removal of all growth except the knapweed and in 1955 the plants were still living. Amizol (Amino triazole) at 2 lb./A. and ACP-L-705 (80% 2,2,3-trichloropropionate) at 4 lb./A. removed the bromegrass but this resulted in a marked increase in the Russian knapweed. The plants were temporarily whitened but regrowth was quite vigorous. Heydon 1281 (trichlorobenzoic acid) at 10 lb./A. resulted in a marked reduction in stand but had little effect on the bromegrass. (Contributed by the Experimental Farm, Indian Head, Sask., Canada).

Toadflax and Other Perennial Herbaceous Weeds

Summary H. A. Friesen

Thirteen abstracts dealing with cultural and chemical studies for the control of toadflax in Saskatchewan and Alberta were received. Keys and Forsberg reporting on six-year's work state that extensive infestations on arable land were reduced in stand by 95% by the use of intensive tillage of fallow alternated with cropping to grain. Two successive years of fallow before cropping did not enhance the control obtained while one year of fallow and two years of grain permitted rapid recovery of the weed. Permitting green growth for 8 days between tillage operations on fallow was essentially as effective as keeping the surface entirely black and required four less operations. The substitution of 2,4-D ester at 2 lb/A for part of the tillage was not as effective as tillage alone. Borate-chlorate compounds at 80 lbs/A used in this way injured the following grain crop. Carder reports that intensive tillage prior to seeding down to a strongly competing grass and this followed by repeated spraying with 2,4-D ester at not less than 2 lbs/A has given very marked reductions in toadflax stands in the past three years.

Keys reported that CMU at 40, 80 and 100 lbs/A applied in 1951 has prevented regrowth of toadflax; wheat seeded on these plots in 1955 did not survive. In the past two seasons borate, borate-chlorate compounds and borate-2,4-D compounds used at rates of 3 to 8 lbs/sq. rod on toadflax in grassland were reported by Carder, Keys, Coupland and Corns as giving very satisfactory control, with little injury to the grass. Sodium chlorate at 6 lbs/A was effective for a two-year period. Seedlings from dormant seeds established themselves on the treated area in the third year. 2,4-D ester at ½, 1, 2, 3 and 4 lbs/A was sprayed on toadflax in barley by Carder, who reported that only at the two heavier rates was there any indication of suppression of growth. 2,4-D ester and amines at rates of 10 to 300 lbs/A applied in 1954 were generally unsatisfactory at dosages up to 40 lbs/A. However, at the higher rates the plots were essentially free of toadflax in 1955. Amizol applied at 16 lbs/A during the bud stage appeared promising according to Pavlychenko.

Wild garlic was treated with amino-triazole at rates ranging from 2 to 32 lbs/A. Willard, Ohio, reported complete kills with the 8 and 12 lb/A rates applied either on March 10 or 30th. Rojers, Indiana, reported complete chlorsis at dosages of 8, 16 and 32 lbs/A. However, bulblets from plants treated with less than 32 lbs/A sprouted when brought into the laboratory. In Ohio P.G.B.E. ester of 2,4-D at 2 and 4 lbs/A applied on March 30 gave 90 and 100% kills, respectively. Applied on March 10 these rates were ineffective.

Field horsetail growing in barley was most effectively top killed by spraying with MCP or 2,4-D at 4 oz/A as soon as it had completely emerged. Hoyt, Alberta, reports that this treatment has given a 70% reduction in stand in the following season. In Manitoba,

DB (borate-2,4-D complex) applied at 3 lbs/100 sq. ft. in 1954 indicated near complete eradication of horsetail in grassland by mid-summer 1955.

Bladder Campion in Saskatchewan was eliminated by DB (borate-2,4-D complex), borate-chlorate and chlorea at 2 and 3 lbs/100 sq. ft. applied in 1954. Similar results were obtained with CMU at 20 and 40 lbs/A. 2,4-D at 30 lbs/A and amino-triazole at 16 lbs/A killed the tops but regrowth was heavy.

Tanweed treated in 1954 with borascu at 12 lbs/A, polybor at 8 lbs/A and sodium chlorate at 6 lbs/A was 97-100% eliminated in 1955. 2,4-D at rates up to 40 lbs/A applied in the spring or fall was unsatisfactory.

Abstracts of Contributors

Toadflax

The effect of different soil sterilants on toadflax. Carder, A. C. Sodium chlorate, CMU and PDU (phenyldimethylurea) were applied in 1953 to an almost continuous stand of toadflax, *Linaria vulgaris*. The sodium chlorate was applied dry at 3 different rates and growth stages of the toadflax. The effects of the various applications were appraised in the autumn of 1953 and again in the early summers of 1954 and 1955. The CMU was applied in a water spray at the rate of 80 gal/A. Five different dosages were used and applications were made when the toadflax was in late bud and in the fall. The PDU was applied in the same manner as the CMU but only when the toadflax was in late bud. The effectiveness of the CMU and PDU treatments was appraised in the sutumns of 1953, 1954 and 1955. Procedure and results are indicated in the table.

Growth stage	Sodium chlorate lb/sq.rd.	% survival A 1953	1954	1955	CMU lb/A	% survival 1953	1954	1955	PDU lb/A	% survival 1953	1954	1955
Spring rosette	2	3.5	6.5	45.0								
	4	2.0	0	6.5								
	6	1.0	0	2.5								
Late bud	2	2.0	0.5	7.5	20	60	40.0	75	20	80.0	42.5	72.5
	4	0	0	5.0	30	25	17.5	50	40	35.0	5.0	11.0
	6	0	0	1.5	40	12	10.0	17.5	80	3.5	0	0
					50	6	2.5	12.5	100	1.5	0	0
					60	5	1.5	5.0				
In autumn post seed set	2	-	0.5	20.0	20	-	37.5	37.5				
	4	-	0	12.5	30	-	13.5	22.5				
	6	-	0	15.0	40	-	6.0	7.5				
					50	-	8.5	10.0				
					60	-	0	0				

A and recovery.

The data show the general inadequacy of these chemicals to permanently remove toadflax. This objective was only achieved in three instances, viz., CMU at 60 lb. ac/A., PDU at 80 and 100 lb. ac/A.

The results with sodium chlorate indicate that temporary removal of toadflax can be achieved with rates of 4 and 6 lb/sq. rod, but re-establishment may take place by germination of dormant seeds. There was little difference whether the chemicals were applied in the spring through to autumn. PDU was shown to have about the same potency as CMU. (Contributed by the Experimental Farm, Beaverlodge, Alberta).

Control of toadflax by 2,4-D in combination with a competative grass. Carder, A. C. An area heavily infested with toadflax, *Linaria vulgaris*, was intensively cultivated in 1952. In the spring of 1953 one-half the area was seeded to creeping red fescue, the other half to brome. Good stands of grass were obtained along with a considerable growth of toadflax consisting of seedlings and resprouts from established plants. No nurse-crop was used with the grass. In the summers of 1953, 1954 and 1955 when the toadflax was in late bud the butyl ester of 2,4-D was applied at nil, 1, 2, 3 and 4 lb/A. acid equivalent in a water spray at the rate of 5 gal/A. Plots were 2 sq. rods in size, quadruplicated and randomized. Appraisal of suppression of toadflax was made in the fall of each year treatment was carried out. Results are as follows:

Rate 2,4-D lb/Ac.	Percent survival					
	Creeping red fescue			Brome		
	1953	1954	1955	1953	1954	1955
Nil	100	100	100	100	100	100
1	90	68	48	60	74	56
2	80	51	40	50	61	61
3	40	28	35	30	32	30
4	30	20	31	30	22	15

The results indicate that there was generally greater suppression of toadflax with the heavier rates. There was not, however, a general progressive reduction of toadflax by the various applicztions of chemical over the years. Not shown in the table is the fact that the grasses themselves offered strong competition to the toadflax. In 1955 it was estimated that fescue had reduced the stand of the weed by 78%, brome by 90%. Wherever one or more pounds of 2,4-D had been applied no viable toadflax seed was produced in any year. (Contribution from the Experimental Farm, Beaverlodge, Alberta.)

The selective control of toadflax in spring grain by 2,4-D. Carder, A. C. An area heavily infested with toadflax, *Linaria vulgaris*, was fitted and seeded to Olli barley in the spring of 1954. A good stand of barley was obtained along with a considerable growth of toadflax consisting of seedlings and resprouts from established plants. In mid-August when the barley was in dough and the established plants of toadflax had reached the bud stage the butyl ester of 2,4-D was applied at nil, 8, 16, 24, 32 and 64 ounces acid equivalent in a water spray at the rate of 5 gal/A. Plots were 2 sq. rods in area, quadruplicated and randomized. The procedure

was repeated in 1955 on the same plots again using Olli barley as the cultivated crop. Appraisal of suppression of toadflax was made in the fall of each year. Results are as follows:

Rate 2,4-D oz/A	Percentage survival 1954	1955
Nil	100	100
8	55	66
16	80	76
24	69	62
32	42	30
64	44	32

The data indicate that except for the two heaviest rates there was little suppression of toadflax. Further, only in the case of these two rates is there much indication of its progressive suppression by perennial application. Yield of Olli barley was not reduced by any treatment. It was estimated yield was reduced 5% by treading when the chemical was applied. (Contribution of Exp. Farm, Beaverlodge, Alberta).

Comparison of granular DB, dry ureabor and CMU spray on toadflax. Corns, Wm. G. and Wm. Vanden Born. Toadflax was in bloom on August 10 when these chemicals were applied: CMU spray 33, 66 lb. acre; Ureabor (CMU content equivalent to above and containing borate in addition) 2, 4 lb. 100 sq. ft.; DB granular (2,4-D-borate cpd.) 2, 4 lb. 100 sq. ft. On October 1, seven weeks after application, all top growth was killed with exception of bases of some plants treated with the low rates of CMU and DB granular. (Division of Crop Ecology, Dept. Plant Science, Univesity of Alberta).

Comparison of various chemical sprays for control of toadflax. Corns, Wm. G. and Wm. Vanden Born. On June 16, plots of toadflax were sprayed with the following preparations: Sodium chlorate 2, 4 lb. per 100 sq. ft.; CMU, Karmex DW, Karmex FW, 50, 100 lb. acre; DB spray (Borate 2,4-D cpd) 2, 4 lb. 100 sq. ft.; 2,4-D ester 61, 122 lb. acre; amino triazole 7½, 15 lb. acre. All chemicals and rates were effective in killing top growth within a few weeks' time. By mid-September there were a few small plants from re-growth in some of the 2,4-D plots and in the plots treated with 7½ lb. AT per acre. (Division of Crop Ecology, Dept. Plant Science, University of Alberta.).

Effect of borax compounds on persistent perennials. Coupland, R. T. and S. Zilke. Numerous applications of borax compounds have been made to well established stands of leafy spurge (Euphorbia esula) and toadflax (Linaria vulgaris) in competition with grass on sandy soils near Saskatoon. Applications of Polybor Chlorate (73% borates, 25% sodium chlorate) in September, 1953 and May, 1954 at 2 and 3 lb. per 100 sq. ft. provided 70 to 100 (Ave. 94.8) per cent control of these weeds in September, 1955 in five tests, while in a sixth (on toadflax) no effect of the herbicide remained. Rates of ½ to 1½ lb. gave similar results where tried, while the 4-lb.

rate caused no apparent increased damage to the weeds. Concentrated Borascu (61.5% B_2O_3) under the same conditions at 4 to 6 lb. per 100 sq. ft. gave 99.7 to 100 per cent control in the first five tests, and 90 to 97 per cent control where no effect of Polybor Chlorate remained after a period of two growing seasons following treatment. Lower rates (down to 1 lb.) were equally effective when used. Complexes of sodium borate (41 and 60%) and 2,4-D (7%) applied in May, 1954 at 1 to 3 lb. per 100 sq. ft. continued to provide 100 per cent control of these weeds in all four tests. The Polybor Chlorate affected grass growth most, while only heavy rates of the other three herbicides damaged grass appreciably. Seedlings have appeared but have not as yet survived. (Contribution from the Department of Ecology, University of Saskatchewan, Saskatoon.)

Effect of heavy rates of 2,4-D on toadflax. Coupland, R. T. and S. Zilke. 2,4-D amine was applied to a well-established stand of toadflax (*Linaria vulgaris*) in competition with native grasses and couch grass (*Agropyron repens*) on June 4, 1954 at four rates ranging from 50 to 155 lb. acid equivalent per acre and on June 18, 1954 at seven rates ranging from 50 to 300 lb. per acre. On oct. 8, 1954 regrowth ranged from 1 to 80 per cent from applications on the first date and from 96 to 100 per cent from those on the second date. Regrowth on July 15, 1955 ranged from 0 to 50 per cent from the first treatment and from 25 to 70 per cent from the second treatment. Treatment with butoxy ethanol ester of 2,4-D at the same rates on the first date had a similar effect to the amine. In all cases the heaviest rates gave the best control. During the first fall after treatment the grass cover in the treated areas was markedly increased in density as compared to the checks. During the second summer seedling growth was frequent in the less heavily treated plots but was absent from the most heavily treated ones. (Contribution of the Department of Plant Ecology, University of Sasktachewan, Saskatoon, Saskatchewan.)

2,4-D at heavy dosages for the control of toadflax. Friesen, H. A., Experiment 1, 2,4-D ester at 10, 20, 25, 30 and 40 lbs/A was sprayed on toadflax at six different dates, namely 1) Sept. 18, 1954, three days after the first killing frost of the season; 2) May 1955 two weeks after the toadflax had begun spring growth; 3) June 1955 during the early flower stage of growth; 4) August 1955, first seed pods had formed; 5) September 6, 1955 just prior to the first killing frost of the season, which occurred on Sept. 9; and 6) September 20, 1955. The toadflax was growing in a ditch bank which had a very sparse covering of brome and native grass. Results: Each of the treatments resulted in a complete top kill of the toadflax. Unfortunately regrowth on those plots treated in the fall of 1954 and prior to September, 1955, while not quite equal to the untreated plots, was very heavy. Regrowth was particularly heavy where the grass stand was very thin or missing entirely. The effect of the treatments made in September, 1955 could not be assessed because active growth had ceased. Experiment 11, Observations were made during the year on the effect of 2,4-D ester at 25 lbs/A applied to toadflax growing in strong competition with brome and Kentucky blue grass. The spraying was done in July, 1954, and repeated in July of 1955 by Mr. V. Bjorkland of the Municipal District of Red Deer, Alberta. Observations in

September of 1955 indicated virtually complete elimination of the toadflax by this combination of strong grass competition and the use of the 2,4-D. (Contributed by the Experimental Farm, Lacombe, Alberta.)

Combination of cultural and chemical treatments of fallow for toadflax (Linaria vulgaris) control. Keys, C. H. and Forsberg, D. E. The fallow of a two year rotation has been alternately tilled and sprayed for toadflax control. Following initial tillage in the spring the plot was divided into seven sub-plots. When regrowth was approximately three inches high single plots were sprayed with Amazol at 1, 2, 3 and 4 lbs/A; boron (2-2,4,5 trichlorophenoxy ethyl 2, 2 Dichloro proprionate) at 6 and 12 lbs/A active ingredients and 2,4-D butyl ester at 2 lbs/A. When resprayed about six weeks later the rates of amazol were doubled and the others remained the same. In all, four cultivations and two sprayings were required to control the weed growth. Weed scores taken from a plot that had received similar treatments in 1954, except that 2,4-D was the only chemical used, indicated that regrowth of toadflax was considerably more than on the fallow that received tillage only. Percentage regrowth was 16.5 compared to 6.3 and .56 for the green fallow and black fallow, respectively. Plots that received polybor chlorate and atlacide at 80 lbs/A in 1954 showed considerable burning of the crop and consequent reduction in yield. CMU at 10 lbs/A left some bare patches in the plot while 2,4-D at 10 lbs/A did not cause any loss of crop. The yields in bus/A of wheat were: Atlacide 15.6; polybor chlorate 18.2; CMU 17.4 and 2,4-D 23.2. (Contribution from Experimental Farm, Scott, Sask.)

Effect of herbicides on control of toadflax (Linaria vulgaris.) Keys, C. H. and D. E. Forsberg. Plots treated with sodium chlorate at 1, 2 and 3 lbs/100 sq. ft.; polybor-chlorate at 3 lbs/100 sq. feet; borascu at 6 lbs/100 square feet; MH at 24 lbs/A; DNOSBP (general) at 10 gal/A in fuel oil; CMU and TCA at 20, 40, 80 and 100 lbs/A in May 1951 were sown to wheat in 1955. A normal crop was produced on all plots except those treated with CMU at 40, 80 and 100 lbs/A and DMOSBP at 10 gal/A in fuel oil. These plots were devoid of all growth. It was interesting to note that there was no evidence of toadflax in the plot that had been treated with borascu at 3 lbs/100 sq. ft. Plots that were treated in 1953 with polybor chlorate and atlacide at 2, 5, 5 and 7.5 lbs/sq. rod; CMU and 2049 at 20, 40, 80 and 100 lbs/A were put into crop in 1955 the 80 and 100 lb. rates of CMU and 2049 resulted in complete sterility while there was some regrowth at the 40 lbs/A rates. The 20 lbs/A rates were relatively ineffective. The polybor chlorate plots at 5 and 7.5 lbs/sq. rod provided a reasonable amount of weed control and the crop was not damaged excessively. Applications of 2,4-D butyl ester at 20, 25 and 40 lbs/A acid equivalent in 1954 provided fair top-growth control in 1955 and very little flowering or seed set. LV4 at 10 lbs/A also slowed down top-growth and flowering in 1955.

In May 1955 an area of toadflax and crested wheatgrass was treated with concentrated borascu at 2, 4, 6 and 8 lbs/100 sq. ft.,

boron 2(2,4,5-trichlorophenoxy) ethyl 2,2 Dichloroproprionate) at 1, 1.5 and 2 pts/Sq. rod and Amazol at 2, 4, 8 and 12 lbs/A. Observations made throughout the season indicated that concentrated borascu at all rates gave good control of toadflax and the grass growth was not affected except at the 6 and 8 lbs/100 sq. ft. rates. The ½ pint rate of boron was ineffective in controlling toadflax growth. The 1 pint rate gave partial sterility while the 1.5 pint rate provided nearly complete sterility. Amizol at the 2 and 4 lbs/A rates controlled top growth for the major part of the season while the 8 and 12 lbs/A rate gave complete control throughout the season. (Contribution from Experimental Farm, Scott, Sask.)

Rotational practices for toadflax (Linaria Vulgaris) control. Keys, C. H. and D. E. Forsberg. Rotation of alternate fallow and grain; fallow grain, grain and fallow, fallow, grain have been under study since the project was revised in 1954. Previous studies indicated that the two year rotation of fallow and grain was the most practical for control purposes and the revised studies have supported this finding. Weed scores, taken after harvest in 1955 indicated that the alternate fallow and grain rotation had reduced the toadflax stand by some 96.8%. The system of two years fallow and crop reduced the toadflax stand by 98.4% but the further reduction in toadflax has not been worth the extra year of fallow. The inclusion of a secondcrop between fallow periods has resulted in an increase in the stands of toadflax. The weed scores taken after removal of the second crop, barley, indicated that the toadflax had increased to approximately 59% of a complete stand. This is also in agreement with earlier findings. (Contribution from Experimental Farm, Scott, Sask.)

Cultural treatments of fallow and stubble for toadflax (Linaria vulgaris) control. Keys, C. H. and D. E. Forsberg. Fallow treatments have been studied in connection with a series of two year rotations. Black fallow has been compared with a form of green fallow and deep tillage had been compared with shallow tillage. Several post-harvest tillage treatments have been tried in connection with a three year rotation. In 1954 fall treatments of stubble included plowing cultivating, blade weeding and no tillage or check. One-half of each of these treatments was cropped in 1955 and the other half fallowed. There was no measureable differences in crop between the check plot, cultivated plot and blade weeded plot, but the crop on the plowed area was cleaner and slightly earlier maturing mainly due to drier soil conditions. There was also less regrowth on the area of fall plowing that was fallowed. There was no reduction in the number of operations where the plow was used for the initial spring treatment. Subsequent regrowth was, however, less apparent than in the adjacent plot that was tilled shallowly at all times. To maintain a weed-free fallow surface in 1955, required eleven tillage operations which was two more than required in 1954. Seven operations were required for weed control where 5-8 days top growth was allowed prior to tilling. Regrowth of toadflax following the crop grown on these two types of fallow was estimated. Regrowth on intensively tilled, or black fallow, was .56% of a complete stand while the

regrowth on fallow where 5-8 days growth was allowed amounted to 6.3%. There was no measureable difference in crop yield between the two fallow treatments. (Contribution from Experimental Farm, Scott, Saskatchewan).

Response of Toadflax to treatments of Amizol in oat crop. 1954-55. Pavlychenko, T. K. In a dense infestation (14 to 219 plants, sq. yd.) of toadflax (Linaria vulgaris), seeded to oat crop, four series of treatments were made at 3, 6 and 16 lbs/A Amizol (3-amino-1,2,4-triazole) at advance rosette, bud and "mowed at bud" stages as follows: T - treated once; TC - treated and cultivated, when regrowth in plots treated at "bud" began to appear; TR - treated and retreated when regrowth was in evidence over the cultivated areas, and TCR - treated and cultivated as in TC and treated and retreated as in TR. Permanent, replicated quadrats were established in all plots and records taken periodically in 1954 and 1955. The amount of regrowth was always expressed in terms of the initial population before the treatment. Moisture was abnormally high in the season of 1954 and about normal in 1955. RESULTS: Top growth was strongly etiolated and slowly killed in all series and at all rates and stages. Regrowth in "rosette" stage was from 4 to 43% at 3 lbs/A; o to 19% at 6 lbs/A; and 0 to 7% at 16 lbs/A. The results at 3 lbs/A rate were considered "unsatisfactory". Those at 6 and 16 lbs/A were highly satisfactory, especially in series TC, TR and TCR. At "bud" stage only 16 lbs/A rate was fully satisfactory with regrowth of 0 to 4%. The other two rates gave great reductions in stand in TC and TCR series, yet agronomically were not satisfactory. At "mowed at bud" stage all three rates and stages in all four series produced very abundant and healthy regrowth, in some cases much higher than the initial population. Unlike several other persistant perennials, toadflax seems to be much more susceptable at the rosette stage than at the "bud" stage. This project was carried out in 1954 in oat crop. The rates used were too high and all of them have caused depression to the crop in various degrees. At 3 lbs/A the crop showed only observable depression in height and yield. (up to 10%). At 6 lbs/A the effect on oats was very serious, not so much on height and stand, but the yield was reduced by 68%. At 16 lbs/A, again the height was further depressed and the yield was reduced by over 75%. (Contributed by Agricultural Division of American Chemical Paint Company, Saskatoon, Sasktchewan.)

Wild Garlic

Control of wild garlic (Allium vineale). Robinson, E. L. and C. J. Willard. Amino trizole was applied to duplicated plots at 4, 8 and 12 lb/A, on March 10 and March 30. The 8 and 12 lb/A rates killed all garlic plants and the 4 lb/A rate killed 60 percent of the plants, regardless of date of application. The PGBE ester of 2,4-D was applied on the same dates at 1, 1½, 2 and 4 lb/A. At the earlier date no treatment proved satisfactory. The March 30 application gave 15, 55, 90 and 100 percent plants killed, respectively. (Contribution of the Ohio Agricultural Experiment Station.)

Treatment of wild garlic with 3-amino-1,2,4-triazole. Rogers, B. J. and A. R. Halvorson. On March 16, 1955, square-rod plots with a heavy stand of wild garlic (Allium vineale) were sprayed with 3-amino-1,2,4-triazole at rates of 2, 4, 8, 16 and 32 lbs/A in 30 gal. of water/A. The plots were located in southern Indiana. A check on the plots was made June 17, at which time the garlic had produced a crop of aerial bulblets and was becoming dormant for the summer. There was no reduction over the control at the 2 lb. rate, 50% reduction at 4 lbs., 75% at 8 lbs., and 90-95% reduction at the 16 and 32 lb. rates. At 8, 16 and 32 lbs. per acre the height of the remaining plants was much reduced. Underground bulblets seemed to be forming under all rates, although formation was somewhat delayed by the higher rates. All inspection of these treatments showed that the plants sprouting from underground bulbs were turning white at rates above 2 lbs., increasing with rate so that at 32 lbs. almost the entire garlic stand was white. Preliminary laboratory tests on the aerial bulblets from treated plants showed some sprouting at rates up to 16 lbs., but not at 32 lbs. (Contribution of the Department of Botany and Plant Pathology, Purdue University, Agricultural Experiment Station.)

Field Horsetail

Effect of 2,4-D and MCP on field horsetail and yield of barley. Hoyt, P. B. The chemicals were knap-sack sprayed at 5 rates: nil, 4, 8, 12 and 16 oz/A acid equivalent to 3 growth stages of the sterile shoots of field horsetail. Equisetum arvense, in Olli barley. This year's treatments were applied to a fresh stand of horsetail and represent a repetition of an identical experiment conducted on a contiguous area in 1954. Application at the first growth stage was made two weeks after the first horsetail shoots emerged and the barley was in the 3-4 leaf stage. Application at the second growth stage was made when the horsetail had reached a height of 15 in. and the barley was in early flower. At the third, the horsetail had reached full growth and a height of 20 in. and the barley was in soft dough. At the time of the first application, 70% of the horsetail had emerged, while at the second and third all the horsetail had emerged. The horsetail was more vulnerable at the second and third stages when emergence was complete than at the first stage. Thus, at the first stage 100% top growth kill was not obtained at any rate of either chemical. At the second stage, 100% kill was obtained with the 12- and 16-oz. rates of 2,4-D and with all rates of MCP. At the third stage, 100% kill was obtained by all rates of both chemicals as shown in the table. These results with horsetail confirm those of the previous year's experiment. The effect of the different rates of chemicals on yield of barley generally agree for the two experiments, i.e., substantial lowering of yield occurred where 2,4-D was applied at the heavier rates to certain stages of the barley. The effects of the different times of application of the chemicals on yield were somewhat different because the barley was at different growth stages when treated in the different years. This condition was brought about by differential response of the barly and horsetail to seasonal conditions. In

Rate	2,4-D						MCP					
	1st App.		2nd App.		3rd. App.		1st App.		2nd App.		3rd App.	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
	Top Growth Kill - %											
Nil	0	0	0	0	0	0	0	0	0	0	0	0
4	2.7	3.0	85.0	93.3	100	100	26.7	41.7	96.7	100	100	100
8	30.0	10.0	93.3	98.3	100	100	40.0	63.3	100	100	100	100
12	43.3	30.0	100	100	100	100	28.3	70.0	100	100	100	100
16	29.3	46.7	100	100	100	100	46.7	68.3	100	100	100	100
	Yield of Barley - Bu/A											
Nil	66.7	68.5	73.4	64.6	62.8	65.0	76.9	73.1	71.6	69.3	63.3	59.6
4	70.5	75.9	67.6	65.6	60.4	64.7	76.7	59.8	74.5	73.0	64.4	63.5
8	74.4	71.1	58.9	50.3	55.6	59.0	74.7	82.4	77.2	65.5	62.3	57.4
12	73.3	77.1	51.5	43.0	55.4	56.6	76.7	73.9	61.9	59.0	62.7	63.9
16	66.0	65.8	49.7	37.8	48.7	59.7	75.8	69.4	67.3	57.0	63.6	50.9

both years greatest reduction in yield occurred when the barley was treated at the flowering stage. The 1954 experiment was examined in 1955to determine if any reduction of stand of horsetail had been induced by the previous year's treatments. When the chemicals were applied after the horsetail had completely emerged and had virtually reached full growth a 70% reduction of the stand was apparent, while practically no reduction resulted by treatment prior to this stage. The results of these experiments indicate that the most feasible treatment for top growth kill and reduction of stand of horsetail was obtained by the 4-oz. rate of the chemicals after the horsetail had completed emergence. Depending on season, treatment should be made when the barley is either in late shot blade or early milk for minimum reduction of yield. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

Further observations of DB powder and DB granular for the control of horsetail (Equisetum arvense). Wood, H. E. and J. R. Mants. At two dates in 1954 at a location 20 miles north of Winnipeg several herbicides were applied to grassland heavily infested with field horsetail. An inspection made in midsummer, 1955, indicated almost complete eradication of horsetail on the several plots treated with DB powder and DB granular applied at the rate of 3 lbs. material per 100 sq. ft. Other chemicals used were ineffective or gave only very limited control. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada.)

Bladder Campion

The effect of herbicides on bladder campion (Silene vulgaris) McCurdy, E. V. An extensive infestation of bladder campion is located east of Indian Head, Saskatchewan. Plots 10 feet square were treated with chemicals in 1954 and 1955. An ester of 2,4-D at

15 and at 30 lb/A. applied in the late summer killed all top growth but regrowth occurred later in the season. Polybor chlorate at 1, 2 and 3 lb/100 sq. ft. was tested. One pound was not effective, 2 pounds were not quite enough but 3 pounds resulted in a complete kill. DB granular at 1 lb/100 sq. ft. weakened the plants and at 2 and 3 killed all bladder campion. DB spray powder killed most plants at 2 lb/100 sq. ft. and all plants at 3 pounds. Chlorea at 2 lb/100 sq. ft. removed most plants and those that remained were very yellow. In 1955 CMU was applied at 10, 20 and 40 lb/A. At 10 pounds the plants were unthrifty and at 20 and 40 pounds most plants were killed and it appeared as if the others would die later. On the plots where CMU was applied in 1954, the 4 lb/A rate was too light, 10 lb/A removed most growth and 20 and 40 pounds gave complete control. Karmex DW at 20 lb/A resulted in discoloration of bladder campion and removal of most brome and other growth. At 40 lb/A the kill was much more effective and at 80 lb/A the kill was complete. Amizol applied at 8 lb/A in 1955 caused yellowing of most plants and at 16 lb/A killed a large percentage. Applied at the same rates in 1954, regrowth in 1955 was quite vigorous. (Contribution by the Experimental Farm, Indian Head, Sask., Can.)

Tanweed

Control of tanweed (Polygonum coccinium). Sand, P. F. and N. E. Shafer. Chemical treatments were applied to tanweed at three dates in 1954; June 18, July 14, and November 8. The June 18 treatment included 2,4-D amine salt, isopropyl ester of 2,4-D with and without a wetting agent, and ACP 638 (2,4-D) at rates of ½, 1, 2 and 4 lb/A. and 20 and 40 lb/A. On July 14, isopropyl ester was applied at ½, 1, 2 and 4 lb/A. The November 8 treatments were 2,4-D amine salt, 2,4-D isopropyl ester, and ACP 638 (2,4-D) at 20 and 40 lb/A. and concentrated borascu at 12 and 15 lb/sq. rod., polybor at 8 lb/sq. rod, DB soluble at 2 and 4 lb/Sq. rod, and sodium chlorate at 4 and 6 lb/sq. rod.

Of the chemicals applied, concentrated borascu at 12 and 15 lb/sq. rod, polybor at 8 lb/sq. rod and sodium chlorate at 6 lb/sq. rod gave best results with 97 to 100 percent kills. The 20 and 40 lb/A rates of 2,4-D gave less than 50 percent kills with both fall and spring applications. The ½, 1, 2, and 4 lb/A rates of 2,4-D gave less than 25 percent reduction in stand andthe wetting agent added to the isopropyl ester apparently did not increase the effectiveness of the chemical. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska).

Johnsongrass and Bermuda Grass

O. Hale Fletchall

Summary

All of the abstracts deal with chemical control of Johnsongrass. Techniques of using chemicals included single applications to soil or foliage, repeated applications at weekly intervals, plowing after treatment, application at base of plants, and mixing dalapon and amino triazole.

The chemicals most widely reported were dalapon, TCA, MH, and amino triazole. The minimum rate of dalapon for satisfactory control varied from 20 to 30 lb/A. Eighty pounds or more per acre of TCA gave control of old plants but in one case a dense stand of seedlings appeared in ten weeks. MH gave unsatisfactory control with a single application of 16 lb/A and three weekly applications of MH at the rate of 10 lb/A each week was also unsatisfactory. Eight lb/A of amino triazole applied weekly for three applications (totaling 24 lb) gave 90 percent control while single applications up to 12 lb/A were not satisfactory.

Abstracts

Chemical control of Johnsongrass. Anderson, L. E. Chemicals used in this study were applied either as soil applications prior to emergence or as foliage sprays when the plants had reached a height of 12 to 15 inches. Dates of application were April 15 and May 21, 1955. The following chemicals at rates indicated were applied directly to the soil: TCA (sodium salt 90%), 40, 80, and 120 lb./A.; CMU, 30, 60, and 90 lb./A.; Phenyldimethylurea (PDU), 30, 60, and 90 lb./A.; Sodium chlorate, 4, 6, and 8 lb./sq. rd.; Polybor chlorate, 4, 8, and 12 lb./sq. rd.; a complex of sodium chlorate 40%, sodium metaborate 57%, CMU 1% (Chlorea), 3, 6, and 12 lb./sq. rd.; 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate (Baron), 8, 12, and 16 oz./sq. rd.; a sodium borate—2,4-D complex (DB Granular), 3, 6, and 12 lb./sq. rd.; and a Boron—CMU complex (Ureabor), 2, 4, and 8 lb./sq. rd. Foliage applications included Baron, 8, 12, and 16 oz./sq. rd.; hexachloro acetone (98%), 1/4, 1/2, and 1 pt./sq. rd.; 3-amino 1, 2, 4-triazole (Amizol), 2, 4, and 8 lb./A.; maleic hydrazide (MH), 4, 8, and 16 lb./A.; 2,2-dichloropropionic acid (dalapon, sodium salt), 10, 20, and 40 lb./A.; 2,4-D (butyl ether ester), 40, 80, and 160 lb./A.; 2,2,3-trichloropropionate, sodium salt, 10, 20, and 40 lb./A.; dalapon combined with amino triazole at half the above rates; and 2,2,3-trichloropropionate combined with amino triazole at half rates for each. With the exception of hexachloro acetone which was applied in diesel oil at the rate of 1/2 gal./sq. rd. all other foliage applications were made with water at the same rate.

Of the chemicals applied to the soil CMU and Phenyldimethylurea at rates of 90 lb./A. were comparable in effectiveness to sodium chlorate and Ureabor at 8 lb./sq. rd. Polybor chlorate and Chlorea required 12 lb./sq. rd. for good control. Eighty pounds of TCA killed 95% of the old plants but a dense growth of seedlings appeared after a period of 10 weeks. DB Granular and Baron did not give satisfactory control when applied as soil applications in this study.

Chemicals applied to the foliage that gave excellent results were Baron at all rates, dalapon, and 2,2,3-trichloropropionate at 20 and 40 lb./A., while hexachloro acetone at 1 pt./sq. rd. gave satisfactory control. The applications of amino triazole and MH resulted in growth inhibition for a limited period but recovery was evident shortly thereafter. Heavy rates of 2,4-D destroyed all top growth but the effects were temporary except for the 160 lb. rate where regrowth was stunted and seed reduction was evident. The addition of amino triazole to

2,2,3-trichloropropionate or dalapon did not seem to alter the effects of those materials. It will be noted that Baron which was unsatisfactory when applied to the soil was very impressive when used as a foliage application. (Contribution of the Kansas Agricultural Experimental Station.)

Summer applications of herbicides to Johnsongrass. Robinson, E. L. and Willard, C. J. Each herbicide was applied three times, one week between applications, starting August 12, to duplicated plots of a heavy Johnsongrass stand. 3-Amino-1,2,4-triazole at 4 and 8 lb/A, to total 12 and 24 lb/A, gave 68 and 90 percent kill, respectively. Dalapon at 5 and 10 lb/A, to total 15 and 30 lb/A, gave 90 and 100 percent kill, respectively. Maleic hydrazide at 5 and 10 lb/A, to total 15 and 30 lb/A, gave 2.5 and 10 percent kill, respectively. (Contribution of Ohio Agricultural Experiment Station.)

Late spring plowing and applications of 3-amino 1,2,4-triazole and dalapon to Johnsongrass. Robinson, E. L. and Willard, C. J. These plots were laid out in an area which was planted to corn in 1954, and had a dense uniform stand of Johnsongrass this spring. Dalapon at 2, 5, and 10 lb/A and 3-amino 1,2,4-triazole at 2, 4, and [illegible]/A were applied to triplicated Johnsongrass plots 14 days and also to additional plots 4 days before plowing. The Johnsongrass was 10 to 18 inches high. The plots were planted to corn June 4, one day after plowing. The late plowing and three thorough cultivations killed most of the Johnsongrass, even on the checks, and there were no discernible differences in the amount of Johnsongrass on any of the plots. Dalapon at 10 lb/A applied 4 and 14 days before plowing and the 5 lb/A rate applied four days before plowing reduced the corn stand 63, 24 and 17 percent, respectively. The other applications did not injure the corn. Late plowing appears increasingly favorable as a control for Johnsongrass in river-bottom.

Dalapon at 20 lb/A acid equivalent, applied to the soil 70 days before corn was planted, gave 80 percent kill of Johnsongrass. Eight lb/A of dalapon plus 2 lb/A of amino-triazole; and 4 lb/A of dalapon plus 1 lb/A of amino-triazole, applied to a heavy stand of Johnsongrass on June 8 gave 82 and 53 percent kill, respectively, as observed on October 10. The plots were plowed one day after chemical application. The regrowth of Johnsongrass in the treated plots appeared weak for one month and then became more vigorous. (Contribution of the Ohio Agricultural Experiment Station.)

Application of chemicals to Johnson grass. Rogers, B. J. and Hart, R. D. On June 1 and 2, 1955, a series of 1/20 acre plots (near Terre Haute, Indiana) heavily infested with Johnson grass (Sorghum halepense) were treated with various chemicals; sodium 2,2-dichloropropionate at 10, 20 and 30 lbs/A, TCA, sodium salt, at 40 and 80 lbs/A, 3-amino, 1,2,4-triazole at 4, 8 and 12 lbs/A, MH at 8 and 16 lbs/A, and sodium 2,2,3-trichloropropionate at 10, 20 and 30 lbs/A, all in 30 gal of water/A. The soil corresponds to a Genesse silt loam. At the time of application the Johnson grass was 2-3 feet in height. One half of the area was divided into 3 strips crossing the plots perpendicularly, and these strips were plowed 2, 3 and 4 weeks after treatment. The other half of the area was plowed and disced, divided into 2 strips crossing the plots perpendicularly, and on June 20, one strip was planted to soybeans and the other to sweet corn. On July 15, inspection showed that at 20 and 30 lbs. of the two propionates and at 40 and 80 lbs. of TCA salt there was little Johnson grass as compared with untreated areas. At all rates for these 3 chemicals the corn and soybeans were doing very poorly. The amino triazole applications gave the characteristic discoloration to the leaves, but no control was evident. The corn and soybeans appeared normal. MH reduced the height of the vegetation somewhat--at the 16 lb. rate the height of the Johnson grass was

about half that on the control plots. The different times of plowing apparently had no effect. On Sept. 29, there was an almost uniform stand of Johnson grass on all plots except those treated with the TCA salt and the 30 lb. rate of the dichloropropionate. The particular plots were covered with a thick stand of Chenopodium album and Xanthium pennsylvanicum, with an occasional stock of Johnson grass in view. The shading effect of these broadleafed plants probably contributed to the subjugation of the Johnson grass. (Contribution by the Dept. of Bot. and Plant Path., Purdue Univ. Agric. Exp. Sta.)

Effect of additives on herbicidal oil and water for spot treatment of Johnson grass (Sorghum halepense). Wiese, A. F. and Rea, H. E. Several oil soluble herbicides were added to herbicidal oil at approximately 1 part herbicide to 31 parts of naptha oil and applied to the base of 8-inch Johnson grass plants on June 23, 1955. Some additional materials not soluble in oil were first dissolved in water and later emulsified with the oil. TCA (sodium salt) and 2-2 dichloropropionic acid (sodium salt) were also applied in water as 1 to 31 solution. Sodium Chlorate was applied only in water at the rate of 1 pound per gallon. Each chemical treatment was applied to one 4 by 16 foot plot. All treatments gave good top kill in 1 week. Eleven weeks after treatment, the plots were scored 1 if little or no Johnson had been eliminated, 2 if the weed stand was markedly reduced, and 3 if no regrowth had occurred. Only 2-(2,4,5-trichlorophenoxy) ethyl, 2,2-dichloropropionate, and hexachloro-acetone in oil and sodium chlorate in water scored 3. CMU, CIPC, 2(2,4,5-trichlorophenoxy) propionic acid (propylene glycol butyl ether ester), DNBP, polychlorobenzoic acid in oil and 2-2 dichloropropionic acid (sodium salt) in either oil or water scored 2. Tetrachloroethelene, 2,4-D ester (propylene glycol butyl ether), dichloral urea, maleic hydrazide (diethanol - amine salt) in oil, herbicidal oil alone, a fortified herbicidal oil (Magnolia S/V Agronyl R.) and TCA (sodium salt) in either oil or water only scored 1. (Contribution from the Amarillo Experiment Station, U.S.D.A. and the Texas Agricultural Experiment Station Cooperating. T.A. 2270)

QUACKGRASS

E. A. Helgeson

Summary

As in previous years, the results reported by the several cooperators emphasize the face that variables such as weather, soil, stage of plant development and cultural practices have a marked effect on control obtained with herbicides. Too few experiments were run under identical conditions to premit any firm conclusions.

Applications to vigorous foliage of sodium 2,2-dichloropropionate (DAL), sodium salt of maleic hydrazide (MH), 3-amino--1,2,4-triazole (ATA), dichloral urea (DCU), a sodium salt of 2,3,6-trichlorobenzoic acid (TCB) at rates from 2 to 12 lb/A have given poor to excellent control for the current season. Plowing about a week after the chemical is applied has frequently enhanced control. Cropping with soybeans gave an appreciable increase in control in one instance.

Soil treatments with CMU, PDU, TCA, DB granular and Dalapon gave variable control. CMU was perhaps the most consistant in giving satisfactory control at rates around 20 lb/A. Toxic residues were reported to be present after 4 years for CMU at 40 lb/A, 2 years for Dalapon at 20 lb/A, TCA at 100 lb/A for 2 years and DB granular at least one season for grain crops.

DAL, trichloropropionic and TCB caused some injury to corn and soybeans planted soon after the chemical had been applied.

Abstracts

Fall applications of TCA, CMU, Dalapon, and DB granular on couchgrass. Brown, D. A. Applications were made October 10, 1954, on an old uniformly thick stand of couchgrass at rates per acre as follows: TCA 100 lb; CMU and Dalapon 40 lb. DB granular dry and in a water spray at 2.5 and 5 lb per 100 sq. ft. Results: as interpreted in percent of regrowth September 14, 1955. TCA 18%; CMU complete kill; Dalapon 65%. DB granular (dry) 70% (in water) 35%. Discussion: All treatments except CMU gave more or less disappointing results. TCA plots while reasonably full of couchgrass sustained a heavy volunteer crop of green foxtail, Russian thistle, some perennial sowthistle, volunteer alfalfa and sweet clover. Dalapon plots were heavily invaded with the same weeds and volunteer legumes as the TCA plots. In addition, Canada thistle grew well. DB granular plots grew Russian thistle in profusion in 1955, also, green foxtail, perennial sowthistle and volunteer alfalfa. (Contributed by Experimental Farm, Brandon, Manitoba.)

Residual effect of TCA, CMU, Dalapon and DB granular. Brown, D. A. These chemicals have been applied to heavy stands of couchgrass over a period of years at the following rates: TCA 25, 50, 75, 100 lb/A, CMU and Dalapon at 20, 40, 60, 80 lb/A, DB granular 2.5 and 5 lb/100 sq. ft. Over a seven-year period of testing, it has been found that TCA at 25 lb/A holds the soil sterile for six weeks to two months. At 100 lb/A sterility disappears at the end of two years. CMU four years after application permitted near normal crops of grain following 20 lb/A; 40% crop on 40 lb/A; 20% on 60 lb/A, but complete sterility to grain crops at 80 lb/A rate. Sterility following Dalapon tested only since 1953, indicates two years after application 80% grain crop on 20 lb. application; 60% on 40 lb; 30% on 60 lb; and 15% on 80 lb/ac rate. DB granular used first in 1954 prevented growth of grain crops in 1955 at both rate of application but Russian thistle grew in profusion, green foxtail less profusely and volunteer alfalfa grew well from established deep rooted plants. (Contributed by Experimental Farm, Brandon, Manitoba).

Effectiveness of various herbicides in controlling quackgrass. Buchholtz, K. P. Plots 15 by 20 feet in an old quackgrass sod were treated with the sodium salt of maleic hydrazide (MH), sodium 2,2-dichloropropionate (DAL) and 3-amino-1, 2,4-triazole (ATA) at 4 lb/A and with dichloral urea (DCU), a sodium salt of 2,3, 6-trichlorobenzoic acid (TCB) and a wettable powder preparation of 2,3,5,6-tetrachlorobenzoic acid (TECB) at 4 and 8 lb/A. Applications were made on April 27 when the grass was about 6 inches tall. The area was plowed on May 2. It was disked on May 3 and May 16 and planted to W575 corn on May 16. CMU was applied overall at 1½ lb/A on May 18. No cultivation was made during the season due to excellent control of annual weeds. Counts of quackgrass shoots were secured on June 13. The corn was harvested on September 22. Estimates of quackgrass growth remaining on the plots were obtained on October 19. The soil on the experimental area was a Miami silt loam.

An analysis of the data showed that all treatments reduced quackgrass shoot counts significantly. The application of DAL and both the 4 and 8 lb/A applications of TCB did not differ significantly in their control of quackgrass and reduced the shoot counts significantly below those of any other application. The quackgrass stand estimates show that regrowth was still scanty at the end of the season on plots treated with DAL and TCB.

Treatment	Quackgrass shoots per sq. ft.	Quackgrass regrowth index 1/	Corn yield bu/A
MH---4 lb/A	12.9	4.3	68.5
DCU--4 "	28.7	6.0	45.8
" --8 "	19.6	7.7	51.0
DAL--4 "	5.2	2.7	76.3
TCB--4 "	3.9	2.0	72.6
" --8 "	0.9	2.0	61.3
ATA--4 "	25.9	8.0	53.4
TECB-4 "	18.2	8.7	59.5
" -8 "	17.0	8.3	65.8
Check	49.8	10.0	19.5

1/ 0 = No regrowth, 10 = Complete recovery.

Corn yields were all increased significantly over that of the check plots as a result of the quackgrass treatments. There were no significant differences between yields of corn on the plots treated with the various materials. No injury to the corn was detected on plots treated with MH, DAL, DCU, ATA, or TECB. Applications of 4 lb/A of TCB caused a slight yellowing of the corn when it was about 2 feet tall, but no permanent effect resulted. Plots treated with 8 lb/A of TCB showed pronounced stalk bending, lack of brace root development and yellowing when 2 feet tall and the symptoms persisted until maturity. (Dept. of Agronomy, University of Wisconsin, Madison, Wis.).

Effect of various herbicides and a competitive crop of soybeans in controlling quackgrass. Buchholtz, K. P. Plots 12 by 36 feet in size in an old quackgrass sod were treated on April 23, 1954, with 80 lb/A of ammonium nitrate. On May 11 when the grass was about 10 inches tall, plots were treated with maleic hydrazide (MH) and 3-amino-1,2,4-triazole (ATA) at 2, 4, and 8 lb/A and with sodium 2,2-dichloropropionate (DAL) at 4, 8, and 16 lb/A. On May 17 the area was plowed. On June 8 a strip 24 feet wide across all plots was close drilled to Blackhawk soybeans

at the rate of 180 lb/A. The unplanted portion of each plot was treated on May 30 with 1½ lb/A of CMU to prevent growth of annual weeds. On July 7, 1954, quackgrass shoot counts were obtained on the portions of the plots not planted to soybeans. In late August 1954 a strip of soybeans 12 feet wide was removed as hay from each plot. In October the remaining 12 foot strip of soybeans was removed as dry beans. In 1955 the entire area was plowed on May 2, planted to W575 corn on May 16, and treated with 1½ lb/A of CMU on May 18 to prevent growth of annual weeds. Quackgrass shoot counts were obtained on June 14, 1955, from plots that had received the various treatments the previous year.

Treatment	Quackgrass shoots per sq. ft.			
	No soybeans		Soybeans removed-Aug.	Soybeans removed-Oct.
	7/7/54	6/15/55	6/15/55	6/15/55
MH 2 lb/A	4.8**	24.4	4.9	0.8
" 4 "	2.3**	20.6	2.3	0.4
" 8 "	1.5**	21.2	0.8	0.6
DAL 4 "	5.4**	27.1	1.5	0.5
" 8 "	2.3**	26.3	0.5	1.0
" 16 "	2.8**	29.2	0.6	0.9
ATA 2 "	7.8	23.5	1.8	0.3
" 4 "	2.9**	18.3	0.6	2.0
" 8 "	2.1**	14.5	1.0	2.0
Check	9.4	38.7	2.0	1.3

All herbicide applications, except the 2 lb/A of ATA, reduced the stands of shoots significantly in 1954. Quackgrass growth increased materially on portions of the plots not planted to soybeans as is shown by the shoot counts obtained in June, 1955. Differences between treatments were not significant on this date. Portions of the plots planted to soybeans had greatly reduced stands of quackgrass on all plots including check. Leaving the soybeans until the mature stage was slightly more effective than removing them at the hay stage. Use of 4 lb/A of DAL caused slight injury to the soybeans with greater injury appearing on plots treated with 8 and 16 lb/A. In all cases the beans made appreciable growth and were effective in reducing the regrowth of the quackgrass. The data indicate that improved control of quackgrass following applications of herbicides will be obtained if the area is cultivated or planted to a competitive crop after treatment to prevent the regrowth of the remnant of the weed remaining. (Dept. of Agronomy, University of Wisconsin, Madison, Wis.).

<u>The effectiveness of 2,2-dichloropropionic acid, 3-amino-1,2,4-triazole and maleic hydrazide in controlling quackgrass when followed by plowing at several intervals</u>. Buchholtz, K. P. Plots 15 by 20 feet in size were established in an old quackgrass sod. On April 6, 1955 the area was fertilized with 150 lb/A of ammonium nitrate. On May 5 when the grass was about 12 inches tall plots were treated with the sodium salt of 2,2-dichloropropionic acid (DAL) at 2, 4 and 8 lb/A and with maleic hydrazide (MH) and 3-amino-1,2,4-triazole (ATA) at 4 lb/A. On May 10 one third of the area was plowed, disked, and dragged. On May 17 an additional third was plowed and on May 25 the remaining third was treated in a similar manner. On May 13, 19 and 26 and on June 3, 15 and 29 single rows of W525 corn were planted across all plots that had been prepared by tillage. On May 30, 1½ lb/A of CMU was applied to all plots to control the growth of annual weeds. The area was not cultivated during the season. The soil type of the area was Miami silt loam.

Rainfall received 7, 14 and 21 and 28 days after treatment was 0.85, 0.85, 0.85, and 1.65 inches, respectively.

Shoot counts obtained on June 21 showed that the 8 lb/A application of DAL was most effective in controlling the quackgrass. Significant reductions were also obtained with the 4 and 2 lb/A treatments. Control of quackgrass obtained with ATA and MH was not as complete as usually secured. The 4 lb/A applications of DAL, ATA and MH were most successful in controlling quackgrass when followed by plowing at the 5 day interval. The 2 and 8 lb/A applications of DAL were not affected materially by the plowing intervals used.

Treatment	Counts after various plowing intervals-pct. check		
	5 days	12 days	20 days
DAL - 2 lb/A	31**	37**	34*
" - 4 "	9**	25**	33**
" - 8 "	6**	6**	8**
ATA - 4 "	61	67	97
MH - 4 "	46*	67	73
Check - shoots/sq.ft.	15.7	21.2	20.7

Corn injury occurred only on plots treated with the 4 and 8 lb/A applications of DAL. The 8 lb/A application caused injury on the plantings made on May 13, 19 and 26 on plots plowed on May 10 but none thereafter. The 4 lb/A applications caused injury only on the May 13 planting. No injury occurred on plots plowed on May 17 or on May 25. (Dept. of Agronomy, University of Wisconsin, Madison, Wis.).

The effect of ammonium sulphamate (Ammate) alone and combined with tillage on couchgrass. Carder, A. C. In mid-May Ammate was applied at nil, 1, 2, 4 and 6 lb/sq. rod to a solid stand of couchgrass. The chemical was applied in a water spray at the rate of 80 gal/A. Plots were one sq. rod in size and in duplicate. In one series the couch sod was left undisturbed; in a second, third and fourth series it was thoroughly one-wayed one, two and three weeks, respectively, after application of the herbicide. The series of plots one-wayed one week after chemical treatment were fitted for seeding immediately following the one-waying and sown to wheat, oats, barley, flax and peas. The effect of the chemical on the couch was appraised in the autumn. Results are shown in the table.

Treatment	Annate lb/sq.rd.	Percentage survival
Annate applied to undisturbed sod	nil	100
	1	100
	2	65
	4	12
	6	8
Annate applied, one-wayed 5 in. deep one week later, seed-bed prepared and seeded to cereals	nil	78
	1	20
	2	11
	4	6
	6	5
Annate applied, one-wayed 5 in. deep two weeks later	nil	78
	1	32
	2	7
	4	4
	6	2
Annate applied, one-wayed 5 in. deep three weeks later	nil	70
	1	22
	2	1
	4	2
	6	0

The data indicate that in no instance did 4 lb/sq. rod of Annate or less completely eradicate the couch and only in one instance, i.e., where tillage was delayed until three weeks after the chemical was applied, did the 6-lb. rate achieve this result. The data further show that delayed cultivation enhanced the effectiveness of the chemical when applied at 2 or more lb. per sq. rod. Wherever any chemical had been applied to the series of plots seeded to grains, the cereals either did not emerge or, if they did, they soon sickened and died. (Very poor crops of any cereal grew on the untreated plots because of competition from the couch. Wheat, oats, flax, in the order named, seemed best able to withstand this competition, barley and peas least able.) (Contribution Experimental Farm, Beaverlodge, Alberta).

Treatment of couchgrass with CMU alone and in combination with cultural means. Carder, A. C. A continuous infestation of couch on a shallow black clay loam was treated in late spring and early fall of 1952 with CMU at 4 different rates. The chemical treatments were combined with 4 tillage practices. The CMU was applied in a water spray at the rate of 80 gal/A. The effects of the various treatments were appraised from time to time. The procedure and results of the experiment are described in the table.

Treatment	CMU Lb/A	Percentage survival after months or years following treatment							
		Late spring treatment					Fall treatment		
		1952 3 mo.	1953 1 yr.	1953 1½ yr.	1954 2 yr.	1955 3 yr.	1953 1 yr.	1954 2 yr.	1955 3 yr.
CMU on undisturbed sod	10	50	15	12	8	12	12	5	7
	20	45	5	4	0	0	4	2	0
	40	30	1	0	0	0	2	0	0
	80	18	0	0	0	0	0	0	0
CMU applied, one-wayed once 5 in. deep two weeks later	10	52	18	40	40	48	65	32	38
	20	40	10	12	6	6	18	14	10
	40	32	5	4	0	0	12	6	5
	80	10	1	1	0	0	4	0	0
One-wayed once 5 in. deep, CMU applied	10	80	28	18	48	35	40	48	55
	20	60	15	18	5	2	32	15	7
	40	42	8	3	1	0	15	1	0
	80	22	2	0	0	0	12	0	0
One-wayed once 5 in. deep, CMU applied, onewayed again immediately	10	62	15	19	25	20	40	35	38
	20	38	12	8	8	5	28	22	25
	40	28	5	2	0	0	25	14	11
	80	15	1	0	0	0	16	8	6

The data indicate that severest injury occurred on undisturbed sod and that cultivation reduced the effectiveness of CMU. Under the conditions of the experiment complete kills were obtained with as little as 20 lb/A active CMU when applied to undisturbed sod. At this rate and over progressive killing up to 3 years after time of application is indicated. (Contribution of Experimental Farm, Beaverlodge, Alberta).

Couchgrass control with Dalapon combined with tillage. Carder, A. C. The experiment consisted to two parts. In the first, Dalapon was applied in 1954 when the couch was one foot high, the sod was thoroughly one-wayed one month later, then two weeks following this again one-wayed with a light one-waying given early in the fall. In the second, the procedure was reversed, i.e., a thorough one-waying was done in the spring followed by a second one-waying one month later with Dalapon applied six weeks after the initial tillage. Like the first part of the experiment, a light one-waying was given in early autumn. The chemical was applied at nil, 10, 20, 40 and 60 lb/A active ingredient in a water spray at the rate of 40 gal/A. Plots were 2 sq. rods in size and in triplicate. In the spring of 1955 the entire area was disced and all plots seeded in part to wheat, oats, barley and flax for chemical residual effect studies. Most of the test plot remained bare to observe survival of couch. Results of the various treatments are shown in the table.

Rate Dalapon lb/A	Percentage survival of couch	
	Dalapon before cult.	Dalapon following cult.
Nil	18.3	28.7
10	10.8	6.7
20	7.8	4.3
40	3.8	1.5
60	5.5	0.5

The data indicate that somewhat greater suppression of couch was obtained where tillage preceded chemical treatment. In no instance, however, was total eradication effected. Difficult to explain are the heavy kills of couch effected by the few tillage operations involved in this experiment where no chemical was applied. Grain yields were taken from the cereals seeded in 1955 but no significance could be attached to those factors, i.e., competition from surviving couch plants or residual effect of the chemical, which may have reduced the yield. (Contribution of Experimental Farm, Beaverlodge, Alberta).

The effect of MH and Amino-triazole alone and combined with tillage on couchgrass. Carder, A. C. In early June MH and Amino-triazole were applied at nil, 4, 8, 12 and 16 lb/A active ingredient to a couchgrass stand 8 to 10 inches tall. The chemicals were applied in a water spray at the rate of 80 gal. solution/A. Plots were one sq. rod in size and duplicated. Treatments were divided into four series, viz., to undisturbed sod, to sod one-wayed one week, two and three weeks following application of the chemical. Inspection in mid-July indicated little recovery of the couch wherever cultivation plus chemical had been applied. Where no chemical treatment had been combined with cultivation slow but certain re-establishment of couch was underway. On the series of plots not receiving cultivation and treated with MH there was no evidence of couchgrass kill but growth was seriously retarded, regardless of rate of application. Where Amino-triazole had been applied alone, the couch was very severely bleached and extensive leaf necrosis had occurred in the case of the heavier rates. By mid-autumn all the treated plots presented a very different picture. The couch in the plots not cultivated showed marked recovery even where the heavier rates of Amino-triazole had been used. Where MH had been applied there was full recovery and return of vigour. The series of plots where cultivation had been conducted also showed considerable resprouting of couchgrass, regardless of rate of application of the herbicides. Final results will not be known until 1956. (Contribution of Experimental Farm, Beaverlodge, Alberta).

The comparative effect of PDU and CMU when applied to undisturbed couchgrass sod. Carder, A. C. PDU (phenyldimethylurea) was applied at 20, 40, 80 and 100 lb/A active ingredient and CMU at 40 lb/A active ingredient for comparison to undisturbed couchgrass sod in the spring of 1953. The chemicals were applied in a water spray at the rate of 80 gal/A. The couch was a foot high and in shot-blade. Soil moisture was good in 1953 through to 1954, but somewhat scant in 1955. The effects of the various treatments were appraised from time to time. Results are shown in the table.

Lb/A.		Percentage survival and recovery after months or years following treatment				
		1953 2 mo.	1953 4 mo.	1954 1 yr.	1954 15 mo.	1955 2 yr.
PDU at	20	43.8	35.0	27.5	51.2	82.5
	40	21.2	10.0	7.2	11.0	10.5
	80	12.5	2.2	2.5	1.2	0.5
	100	7.5	1.0	1.2	0.5	0.0
CMU at	40	21.2	10.0	6.0	10.5	9.2

The data indicate that under the conditions of this experiment more than 80 lb/A of PDU are required to completely remove couchgrass. At 40 lb/A of this chemical total elimination is approached one year after treatment but some recovery may be expected after that time. With 20 lb/A only a partial kill was obtained and recovery was rapid in the second year. The data further indicate that at 40 lb/A there is apparently no difference between the lethal effect of PDU and CMU on couchgrass. (Contribution of Experimental Farm, Beaverlodge, Alberta).

Fall treatment of couchgrass with amino triazole followed by spring cultivation and seeding to wheat and rye. Corns, Wm. G. and Wm. Vanden Born. Densely infested strips of couchgrass uncultivated since the previous spring were sprayed on September 14, 1954 with 15 lb. active ATA per acre. The treated grass browned before freeze-up. On May 11, 1955, half of the treated area was plowed and disced, the other half double disced only, before seeding to plots of spring wheat and winter rye. There was no apparent residual effect of the chemical. Only one or two couchgrass plants survived in each of the 200 sq. ft. ATA treated and cropped areas compared with complete regrowth of couchgrass on the cultivated check areas which practically eliminated the grain. There was 2 - 10% survival of grass on land fall-treated and spring-cultivated but not cropped afterwards. Apparently even higher rates of this chemical would have been necessary for absolute eradication of the grass such as might be the aim in preparing new lawns. (Division of Crop Ecology, Department of Plant Science, University of Alberta).

Spring treatment of couchgrass with foliage sprays followed by cultivation. Corns, Wm. G. and Wm. Vanden Born. Field-grown couchgrass 6-8 inches high was sprayed on May 28, 1955, with the following materials: amino triazole 3, 6, 12 lb. active chemical per acre; Cpd. 6249 (2,2,3-trichloropropionic acid) 12, 24, 36 lb. per acre; and Dalapon 12, 24, 36 lb. per acre. The area was plowed and disced on June 29 shortly after appearance of some new regrowth in a few of the plots. Observations during first week in October showed no regrowth in plots treated with the highest rates of ATA or Dalapon but up to 5% and 30% regrowth respectively in plots treated with the intermediate and low rates of these chemicals. Cpd. 6249 was somewhat less effective, the regrowth being approximately 20, 70 and 90% following the use of the 36, 24, and 12 lb. rates. (Division of Crop Ecology, Dept. of Plant Science, University of Alberta).

The effect of herbicides on couchgrass. Forsberg, D. E. In July, 1954, a series of plots 8 x 12 ft. replicated 6 times on a solid stand of couch were top sprayed at the heading stage, half the replicates being mowed, were treated with CMU at 20 and 40 lbs/A, TCA at 50, 75, 80 and 100 lbs/A, Dalapon at 10, 30 and 50 lbs/A, Karmex W, DW, and FW each at 40 and 60 lbs/A, and Amizol at 1, 2 and 3 lbs/A. Results: In 1955 the plots receiving CMU, the Karmex, and TCA were the only

ones that showed 100% kill. All other plots had very good growth during the summer. (Contribution by Experimental Farm, Scott, Saskatchewan).

Effect of herbicides on couchgrass. Friesen, H. A. and D. R. Walker. In June, 1954 various herbicides were applied to undisturbed couchgrass sod. Two weeks after treatment one-half of each plot was ploughed and sown to barley. In May, 1955 the ploughed portion of each plot was one-way disced, harrowed and sown to barley. The remainder of each plot was again left undisturbed in 1955. Results: CMU and Karmex FW at 10 lb/A had upwards of 50 percent regrowth on the undisturbed portion. On the ploughed portion regrowth was nearly 30 percent. Only a few plants of barley survived. Plots treated with 20 lb/A and not ploughed showed 25 percent regrowth, while on the ploughed portions only a few weak plants survived. At the 40 and 60 lb/A dosages no couch or barley survived. TCA plots treated with 20, 40 and 60 lb/A and left undisturbed had made almost complete recovery. On the ploughed portions regrowth of couch was 90, 15 and 10 percent, respectively. The barley was normal on each of these plots. Plots treated with DB (borate-2,4-D mixture) at 1, 2, 3 and 6 lb/sq. rod showed complete recovery in 1955. Amino triazole at 8 and 12 lb/A plus the tillage had only some 25 percent regrowth of weak couch shoots, while the barley appeared normal. Recovery on plots treated at dosages of ½, 1, 2 and 4 lb/A was virtually complete. MH-30 at 5, 10, 15 and 20 lb/A and left undisturbed showed complete recovery. When combined with ploughing and seeding the couch stand was 80 percent reduced by the two heaviest dosages, while the barley was uninjured. Dalapon at 10, 20 and 40 lb/A combined with tillage showed only 40, 10 and 1 percent regrowth, respectively. Barley seeded in 1955 was not damaged. Regrowth on the undisturbed portions was negligable at the two heaviest rates. Ammate gave 80 percent control with or without cultivation at dosages of 4 and 6 lb/sq. rod. Plots treated with Borascu, at 8 lb/sq. rod had completely recovered. (Contributed by the Experimental Farm, Lacombe, Alberta).

Comparison of TCA and Dalapon for quackgrass control. Herrett, R. A. and Dunham, R. S. Fall applications of Dalapon and TCA were compared. Dalapon was applied to the foliage at 10, 20 and 30 lb/A. These plots were plowed 19 days later. Dalapon at 12 and 20 lb/A and TCA at 25 and 35 lb/A were applied to plowed soil. Results: Observations made 8 months after application indicated 100% kill of quackgrass with 20 and 30 lb/A of Dalapon applied to the foliage. Twelve months after treatment, there was no regrowth at these rates. At 10 lbs there was a 90% stand reduction. Applied to the soil, 12 lb of Dalapon reduced the stand 80-85% and 20 lb reduced it 90%. TCA was less effective than Dalapon at both rates, resulting in 80-85% reduction in stand.

Two plots treated with Dalapon applied to the soil at 12 and 20 lb/A comprised two soil types. A distinct separation occurred between a mineral soil at one end and a highly organic soil at the other. The Dalapon was much more effective on the organic soil resulting in 100% kill with 12 lb as compared to 80-85% on the mineral portion. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn., Paper No. 3452, Sci. Jour. Series, Minn. Agric. Exp. Station).

Controlling quackgrass on agricultural land with Amino-triazole, 1954-55. Pavlychenko, T. K. 1954 season. One part of a grain farm infested with sodded quackgrass was divided into a series of 32 x 144 ft. plots. On July 8, 1954, when the quackgrass was at the heading stage, these plots were treated with 3, 6, 9, 12, 16 and 20 lbs/A of Amizol (3-amino-1,2,4-triazole) respectively. The plots were further subdivided crosswise into 9, 16 x 32 ft. strips, which were used as follows 1st. - untreated and uncultivated - check; 2nd. - cultivated immediately prior to treatments; 3rd. - cultivated immediately after treatments and 4th., 5th., 6th. ,

7th., 8th. and 9th. - cultivated 3, 6, 9, 12, 24 and 36 days after treatments respectively. When the regrowth on the latest cultivated strip (9th.) began to appear, the original plots (32 x 144 ft.) were each divided lengthwise into two 16 x 144 ft. plots. The west halves were permitted to enter winter without further treatments. The east halves, on September 4, 1954, were retreated at the same rates as the initial treatments. An entire growing season of 1954 was exceptionally wet. Results: All plots with one initial treatment produced from abundant regrowth at the 3 and 6 lbs/A rates to considerable but gradually decreasing as the rates and time of cultivation after treatments increased. At least 50% of the shoots were discolored and died; others remained green and survived. The retreated plots also produced many shoots, but these were intensely bleached and most of them died. In 1955 shoots were quite numerous in all plots including 20 lbs/A rates. In the plots treated once, these were mostly green but slow growing. In the retreated plots they were 100% discolored and dying soon after emergence. On May 15, the entire project was cultivated and sown to barley. The results from plots treated once may be presented as follows:

Effect of one application of Amizol and one cultivation on quackgrass and yield of barley.

Rates	Regrowth of quackgrass				Yield of barley bu/A
3 lbs/A	Abundant	retarded		green	0 to 11.1
6 lbs/A	Considerable	very retarded		"	2.0 to 37.7
9 lbs/A	0 to considerable	"	"	"	3.8 to 36.0
12 lbs/A	0 to very light	"	"	"	10.0 to 48.0
16 lbs/A	0 to occasional sprout	"	"	"	16.0 to 53.3
20 lbs/A	0 to bear presence	"	"	"	24.0 to 48.8

The average yield of 16 check plots free of quackgrass was 48.8 bu/A. In all retreated plots, including 3 lbs/A rates, quackgrass was entirely eliminated and barley yields were normal, ranging between 30 and 53 bu/A. The only plots yielding below 30 bu/A were those where the amount of dead dry stolons on the surface was so great that it interfered with normal germination of barley, resulting in drastically reduced stand. There was no soil sterility even at the highest rates used. From this work it is evident that cultivation and retreatment at lower rates (3 to 6 lbs/A) are as, or even more, effective than the high rates (16 and 20 lbs/A) without cultivation and retreatments. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Saskatchewan).

Effect of Amizol on quackgrass when used alone and in mixtures with ACP705A, 1955. Pavlychenko, T. K. In a heavy sod of quackgrass (Agropyron repens) at the heading stage, one series of 20 x 20 ft. plots was treated with 3/4, 1, 2, 4, 6, 8 and 12 lbs/A of Amizol (3-amino-1,2,4-triazole) alone. On the same day another two similar series were treated with the same rates of Amizol, plus 4 and 8 lbs/A of ACP705A respectively. On the 8th of August, one-half of each plot in all three series was plowed, when the soil moisture was quite low. On August 13th, nearly one inch of rain fell and the moisture was considerably improved. The final readings for the season of 1955 were taken on October 21st. Results: Series 1. In Amizol treatments from 3/4 to 6 lbs/A, the original top growth was only partially damaged or killed, progressively more as the rates increased. At 8 and 12 lbs/A it was 100 pct. killed. Regrowth was very general with only gradual decrease from 3/4 to 2 lbs/A. At 4 and 6 it was quite scarce (20 and 3 pct.), strongly etiolated and depressed. At 8 and 12 lbs/A regrowth was absent. Over the cultivated areas

regrowth was very scarce, less than 2 pct. at the lowest rates and less than .5 pct. at 8 and 12 lbs/A rates. Occasional shoots at higher rates were strongly discolored and sick. In series 2 and 3, where 4 and 8 lbs/A of ACP705A, respectively, were added, the general picture, in both uncultivated and cultivated plots, was very much the same as in series 1. The only difference was that the original top growth was somewhat more damaged or killed at the corresponding rates of Amizol alone. These are preliminary results. Final records will be taken in 1956. (Contributed by Agricultural Division of American Chemical Paint Co., Saskatoon, Sask.).

Comparative test on quackgrass stubble treated with Weedazol, Dalapon and ACP705A. Pavlychenko, T. K. On quackgrass (Agropyron repens) dense sod, a heavy crop of hay, well in head, was cut first. When the regrowth reached 6 to 8 inches, plots 20 x 90 ft. each were treated with 2, 4, 6, 8 and 12 lbs/A Weedazol (3-amino-1,2,4-triazole); 20 lbs/A of Dalapon (2,2-dichloroproprionic acid), and 20 lbs/A of ACP705A (2,2,3-trichloroproprionic acid). Two weeks after the treatments one-half of every plot was plowed and another half left undisturbed. At the time of treatment and plowing, moisture was rather low. Seventeen days after cultivation a rain of .4 inches fell and the moisture was considerably improved. The final reading for the season was taken on October 20th. Results: In plots treated once with 6, 8 and 12 lbs/A of Weedazol, no regrowth was recorded. At 2 and 4 lbs/A about 40 and 16 pct. regrowth was present, but mostly discolored and sickly looking. In plots treated with 6, 8 and 12 lbs/A of Weedazol, and cultivated, regrowth was absent. At the lower rates (2 and 4 lbs/A) regrowth was 1 or less pct. strongly discolored and sickly looking. In uncultivated plots treated with 20 lbs/A of ACP-705A, the original top growth was not fully killed and the regrowth was somewhat retarded but quite general. Over the cultivated half of the plot, regrowth was uneven, from 15 to 40 pct., and normal. In a similar treatment with Dalapon, the top growth was 100 pct. killed. Regrowth was 3 to 4 pct., also normal. Over the cultivated areas regrowth was 3 to 25 pct., and normal. These results are preliminary and final readings will be taken in 1956. (Contributed by Agricultural Division of American Chemical Paint Co., Saskatoon, Saskatchewan).

A comparative test on effectiveness of Dalapon and ACP705A on quackgrass in heading stage, 1955. Pavlychenko, T. K. In a vigorous stand of quackgrass (Agropyron repens) at the heading stage, 20 x 90 ft. plots were treated with 4 and 8 lbs/A of Dalapon (2,2-dichloroproprionic acid) and with 4 and 8 lbs/A of ACP705A (2,2,3-trichloroproprionate) for the purpose of comparing the action of the two chemicals. On August 12th one-half of each treatment was cultivated, when the soil moisture was quite low. On August 13th a prolonged rain (.9") fell and considerably improved this condition. Final readings for the season of 1955 were taken October 22. Results: The top growth in plots treated with 4 and 8 lbs/A of Dalapon was not fully killed. The regrowth at 4 lbs/A was quite general and green. At 8 lbs/A it was less prevalent, more depressed, but green. Agronomically the degree of control was unsatisfactory with both rates. At the corresponding rates, regrowth, over the cultivated areas, was extremely scarce (less than 1 pct.), but always green and healthy. In ACP705A treatments at the corresponding rates, the amount of top kill was considerably less and the amount of regrowth both over uncultivated areas was higher. The final records will be taken in 1956. (Contribution by Agricultural Division of American Chemical Paint Co., Saskatoon, Sask.).

Effect of Amizol alone and in combination with proprionic compounds on quackgrass, 1955. Pavlychenko, T. K. On June 18th a tract of vigorous sod of quackgrass in early heading was divided into five ranges of 50 x 250 ft. each (A2, A4, A6, A12, A16) and treated with 2, 3, 6, 12 and 16 lbs/A of Amizol (3-amino-1,2,4-triazole) respectively. The same area was divided into five 50 x 250 ft. strips crosswise (0, 705A, 705A8, D4, D8) and on the same day these were treated at 0, 4

and 8 lbs/A rates of 705A (2,2,3-trichloropropionate) and 4 and 8 lbs/A of Dalapon (2,2-dichloroproprionic acid). On July 7 half of each of the five amizol ranges was cultivated. Records on top kill and reduction in stand as indicated by regrowth expressed in pct. of original population were taken throughout the season. The purpose of this project was to determine if there was any reaction between Amizol and the combined chemicals. The average results as obtained from the late records (September 29) in 1955, are given in the following table:

Combinations		A M I Z O L									
		2 lbs/A		4 lbs/A		6 lbs/A		12 lbs/A		16 lbs/A	
		% reduction		% reduction		% reduction		% reduction		% reductio:	
		Sod	Cult.	Sod	Cult.	Sod	Cult.	Sod	Cult.	Sod	Cult.
0	29/9	12	25	25	80	65	90	93	80	94	91
705A 4 lbs/A	29/9	25	30	30	80	75	70	94	90	96	97
705A 8 lbs/A	29/9	30	40	35	83	80	65	96	98	97	98
Dalapon 4 lbs/A	29/9	95	97	90	85	93	97	90	96	97	93
Dalapon 8 lbs/A	29/9	97	99	95.5	99	92	98	99.5	100	99	99

The records given above are preliminary to be further verified in 1956. Amizol alone at rates of 2 to 6 lbs/A on undisturbed sod was inadequate to give a practical control of quackgrass. It did so at 12 and 16 lbs/A rates. With cultivation added it gave a high degree of control at 4, 6, 12 and 16 lbs/A rates. The regrowth in all Amizol plots was intensely etiolated and sick. An addition of 705A produced only slightly higher mortality and did not interfere with the etiolation of sprouts. Addition of Dalapon has markedly increased effectiveness of the two chemicals at both rates, but the regrowth in Dalapon plots was obviously less etiolated than that of the Amizol or Amizol-705A plots. The treatments in the above table, which in 1955 gave consistantly highly promising results are underlined. (Contributed by Agricultural Division of American Chemical Paint Co., Saskatoon, Saskatchewan).

Controlling quackgrass and Canada thistle in mixed infestations, 1955. Pavlychenko, T. K. On farm lands a mixture of quackgrass and Canada thistle frequently occur and create the most difficult problem, since the two weeds react quite differently to both cultural and chemical treatments. In a mixed infestation of this kind on summer-fallowed land, in one series the weeds were treated when quackgrass was at the heading stage. In another similar series the weeds were cut at the heading stage and permitted to produce dense regrowth up to 8 inches high. The first series was treated on July 11 and the second series on July 23. Plots, 32 x 120 ft. each, were treated with 6 lbs/A of Weedazol (3-amino-1,2,4-triazole); 6 lbs/A of Weedazol plus 2 lbs/A of Weedar 80 (amine salt of 2,4-D); 8 and 20 lbs/A of Dalapon (2,2-dichloroproprionic acid); and 8 and 20 lbs/A of ACP705A (2,2,3-trichloropropriona te). On August 8, one-half of each treatment was plowed. Numerous, permanent, 4 sq. ft. quadrats, were established and periodical records on top kill and regrowth taken and always expressed in terms of the original population. The final records for 1955 were taken on October 22. Results: In general, all treatments with Weedazol alone or in mixtures, were considerably more effective, when applied on the regrowth of cutover areas, than, when the uncut weeds were at the heading stage. With Dalapon and ACP705A the same was true on quackgrass, but no such difference was observed on Canada thistle. In series 1, at 6 lbs/A of Weedazol, top kill of quackgrass was 98 pct. with about 3 pct. partially discolored

shoots. Still less regrowth (up to 1 pct.), very strongly discolored, was recorded over the cultivated areas. Canada thistle was top killed, but produced numerous partially etiolated shoots. In series 2, top kill in quackgrass was practically 100 pct. and only occasional strongly etiolated shoots were observed in both uncultivated and cultivated areas. Canada thistle was 100 pct. top killed but produced up to 30 pct. partially etiolated shoots. Results with 6 lbs/A of Weedazol plus 2 lbs/A of Weedar 80 in both series were almost identical to Weedazol alone, with quackgrass, but the regrowth of Canada thistle was not only less numerous (up to 12 pct.) but also much weaker. The treatments with Dalapon, and especially with ACP705A, at 8 lbs/A rates in series 1, were quite unsatisfactory and only slightly better in series 2 over the cultivated areas. At 20 lbs/A, Dalapon produced 100 pct. top kill of quackgrass in both series, but healthy regrowth in series 1 was up to 35 pct., and in series 2, up to 14 pct. The corresponding results with ACP705A were still less favorable. Both chemicals were almost fully ineffective on Canada thistle. The final readings will be taken in 1956. (Contributed by Agricultural Division of American Chemical Paint Co., Saskatoon, Saskatchewan).

Spring application of chemicals for quackgrass control. Slife, F. W. Vigorous quackgrass sod, 8 to 10 inches tall, was sprayed April 21, 1955 with the following chemicals. Rates given are in terms of commercial material, not active ingredient per acre. MH-40* 10 lbs, Dalapon 4 lbs. Dalapon 8 lbs, Dalapon 12 lbs, 6249** 4 lbs, 6249 8 lbs, 6249 12 lbs, AT*** 2 lbs, AT 4 lbs, AT 8 lbs, 6249 8 lbs + AT 1 lb, MH-40 5 lbs + Dalapon 4 lbs, MH-40 5 lbs + 6249 4 lbs, MH-40 5 lbs + AT 1 lb, Dalapon 12 lbs + AT 1 lb, 6249 12 lbs + AT 1 lb, Dalapon 12 lbs + AT 2 lbs, 6249 12 lbs + AT 2 lbs, Dalapon 4 lbs + AT 2 lbs, Dalapon 8 lbs + AT 2 lbs, 6249 4 lbs + AT 2 lbs, 6249 8 lbs + AT 2 lbs, Dalapon 4 lbs + AT 1 lb, Dalapon 8 lbs + AT 1 lb, 6249 4 lbs + AT 1 lb. All treated plots were plowed under 1 week after chemical application. Two weeks after plow down 4 rows of corn and 4 rows of soybeans were planted in the treated area and 4 weeks after plowing an additional 4 rows of soybeans and 4 rows of corn were planted in the treated area. Rainfall was normal during this period with 1.63 inches falling after chemical treatment and before the 1st planting, 2.11 inches fell between the 1st and 2nd planting and good rain fell after the 2nd planting. Notes were taken at 3 times during the growing season on the percent control of quackgrass and the amount of injury to the corn and soybeans. Dalapon either alone or in combination was the outstanding chemical in this test. At 4 lbs/A Dalapon gave 70% control, at 8 lbs/A 98% control and at 12 lbs 100% control. All the other chemicals reduced the stand of quack but did not approach Dalapon in effectiveness. None of the combinations were any better than the individual chemicals except where Dalapon was included and in these cases the control was comparable to the same rates of Dalapon alone. Only Dalapon and the trichloroproprionic acid produced injury on the corn and soybeans. In all cases the Dalapon injury was more severe when equal rates were compared. Injury on both corn and soybeans planted 2 weeks after plowing was slight at the 4 lb Dalapon rate, severe at both the 8 and 12 lb rate. At the 4-week planting date there was no injury at the 4 lb rate, none to slight at the 8 lb rate, and slight at the 12 lb rate of Dalapon. *Maleic hydrazide, **Trichloroproprionic acid, ***Amino triazole. (Contribution of the Department of Agronomy, Illinois Agricultural Experiment Station).

Effect of Amino triazole, Dalapon and Maleic hydrazide on quackgrass. Sylwester, E. P. and Bakke, A. L. Three large plots each 66 by 360 ft. were sprayed with Amino triazole 4 lb/A, Dalapon 10 lb/A, Maleic hydrazide 10 lb/A, where the area was spotted with heavy infestations of quackgrass on April 20 and on May 5 and 6 and ground had been plowed and corn planted. On July 13 and September 23 the ground in all three plots was practically free of quackgrass. There was no injury to the corn where Amino triazole and Maleic hydrazide were used. The Dalapon area

at the rate of 10 lbs per acre was free of quack but caused severe injury to the corn. A larger area treated with 10 lbs MH-40 gave good control of the quackgrass without injury to the corn. Final evaluation will be made in 1956. (Iowa Agricultural Extension Service and Iowa Agricultural Experiment Station).

The effect of herbicides on couchgrass. Towill, W. B. In June, 1955, a total of thirteen chemical treatments and three dates of tillage, (ploughed 1 week prior to spraying and 1 and 2 weeks after treatment), were applied to plots 8 x 100 feet, replicated two times on a brome, couchgrass sod mixture. Chemicals and rates were as follows: Amino triazole 1, 2, 4, 6 lbs per acre, Dalapon 30 lbs per acre, Annate 4, 6 lbs per acre, TCA 20, 40, 60 lbs per acre, CMU 10, 20 lbs per acre, ACP-705A (2,2,3-trichloropropionate) 8 lbs per acre and the combination spray composed of ACP705A (2,2,3-trichloropropionate) and Amino triazole at 8 and 2 lbs per acre, active ingredient respectively. All chemical treatments with the exception of ACP-705A 8 lbs per acre, Amino triazole 1 lb per acre, Annate 4 lbs per acre provided an excellent top growth kill. In late September considerable regrowth was noted on the Dalapon, Amino triazole plots at all rates of application. TCA at 40, 60 lbs per acre and CMU at 10, 20 lbs per acre proved highly effective in controlling couchgrass regrowth this season. No essential difference was noted between the two post tillage treatments, however, TCA appeared more effective on the pretilled plot area. Final results of this trial shall not be fully evaluated until 1956. (Contribution of Experimental Farm, Scott, Saskatchewan).

Observations on earlier applications of CMU to control quackgrass, horsetail, etc. Wood, H. E. and Watson, W. D. In May 1951, dense stands of quackgrass, in Winnipeg on clay loam, were treated with CMU at rates 20 to 80 lbs/A. At the close of the fifth summer the 60 and 80 lb plots were still free of quackgrass. One plant of asparagus had survived throughout on the 80 lb plot; there was considerable invasion of Canada thistle and other mixed growth on other than the 80 lb plot. One-half of the 20 lb plot, receiving in 1952 an additional 10 lb/A CMU, showed less infestation than the other half on the 40 lb plot. Replicated plots in the same area, carrying a variety of growth, but with field horsetail the dominant weed, were treated June 1953, 20-40-60 lbs/A. After three summers the 40 and 60 lb plots were practically free of growth (except Western Snowberry that has been quite persistent since treatmet). (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Manitoba, Canada).

Effect of maleic hydrazide on quackgrass (Agropyron repens). Wood, H. E., Fraser, D. D., Howden, J. S. A dense stand of quackgrass was knap-sack treated in mid-June 1955 near Winnipeg, with MH at rates of 3 and 6 lbs/A in 80 imperial gal. water. While the soil was moist at time of application extremely dry weather followed. Ten days after application plots were shallow mold-board plowed, receiving no tillage thereafter. Final assessment of plots in mid-September, while showing a better than 50% reduction in stand of quackgrass, revealed no visible difference between either rate and the check. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Manitoba, Canada).

Annual, Winter Annual, and Biennial Weeds

R. S. Dunham

Summary

Of the 68 abstracts submitted, 39 reported studies of wild oats. IPC and CIPC were used in 17 trials. All but two, at Fargo, N. Dakota and Crookston, Minnesota, were made in Canada. The herbicides were applied both fall and spring. Good to excellent control of wild oats was reported by several investigators with fall applications of 10 to 15 lb/A. Sexsmith obtained a 60% reduction of the weed at harvest with 15 lb, McCurdy reports a 50% reduction, and Andersen found that an early control of 82% with 12 lb/A did not last. Thorough incorporation of the chemical with the soil is essential for best results. November applications were better than October treatments at 8 lb but there was no advantage at 12 lb, and packing after disking or mowing of the stubble did not increase effectiveness of the chemical.

IPC at 8 lb/A, applied in the spring, resulted in fair to good control of wild oats at Fargo, N.D. At 12 lb, control was excellent. Sugar beets survived the 12 lb application but flax was severely hurt by 8 lb. IPC at 6 lb/A gave 95% control without injury to peas in Manitoba. When wild oats were sown experimentally, 4 lb/A of either IPC or CIPC gave excellent control. Under dry conditions for a month after sowing wild oats, 10 lb of CIPC reduced plant count 66% and 10 lb of IPC 60%. The rotovator proved superior to the disk for incorporating these chemicals with the soil. Intervals from one minute to 24 hrs between treatment and rototilling made no difference.

Maleic hydrazide to destroy the viability of wild oat seeds was also tried extensively. If applied at a critical stage, MH has been very effective. Apparently the treatment is most successful if made when the wild oats are in the milk to early dough stage. Hay and Molberg and Leggett indicate that the vulnerable period lasts only 4-7 days. Ebell points out the difficulty of suppressing germination in panicles of various stages of development as found on main culms and tillers. Although some good results are reported for ½ lb /A, a somewhat higher rate is suggested by the trials. Andersen found little difference between MH30 and MH40 and adding Orvas wetting agent did not help in a study by Molberg and Leggett. These authors found no reduction in the wild oat infestation on land in 1955 that had been sprayed in 1954. Although the yields of crops generally were not reduced, frequently the germination of the seed was hurt severely. Olli barley escaped injury in most trials.

Andersen and Helgeson sprayed wild oat plants in the boot stage with Dalapon. They found a striking carry-over of herbicidal effect in normal-appearing seeds.

The acetamides of Monsanto, amino triazole, Dalapon, CMU, TCA, Endothal, and 3,4-D were used in numerous trials. Applications of CDAA and CDEA up to 4 lb/A were ineffective. At Fargo, 6 lb were also ineffective and under dry conditions at Lethbridge, Alberta, 10 lb were unsatisfactory. A 3 lb pre-planting application of CDAA and 6 lb of CDAA or CDEA were very effective when applied pre-planting or pre-emergence at Winnipeg. Ebell concluded that incorporation with the soil is preferable to surface treatment under dry conditions. When the chemicals were mixed with the soil, however, crops were more seriously injured.

Amino triazole at 10 and 20 lb/A reduced the stand of wild oats from 50 to 70% and severely stunted the plants. Plants were likewise badly stunted by 5 and 10 lb of Dalapon. CMU at 5 lb and TCA at 20 lb killed all plants but residues were too toxic for crops. 3,4-D was insufficiently tried but looked promising. In a study of temporary soil sterilants for wild oats, Molberg and Leggett found that 16 lb of Endothal and 48 lb of CIPC applied in the fall of 1953 prevented all wild oat growth until after July 1, 1954 but in 1955 wild oats were back. Applications in the fall of '54 resulted in 90% or better control from 50 lb of 2,4-D; 35 lb of CIPC; and 20 lb of Endothal. Reductions of 40 to 70% resulted from 20 lb of TCA and 10 lb of Dalapon.

Cultural methods were also studied. When wild oats constituted 22% of the stand of crop, wheat yield was reduced 15%; when 57% of the crop, the yield was cut 25%. Delayed sowing of wheat or barley significantly reduced wild oats in a number of trials. It also resulted in lower yields unless rates heavier than normal were sown.

Kommedahl studied the variation among seed lots of wild oats in germination, hull color, grain size, and microflora. Hull color was not a factor, large grains germinated better than small, and germination was increased by removal of the hulls.

The responses of numerous weed species to a variety of herbicides were reported. Jordan and Dunham submitted a tabular abstract on the control of grass and broad-leaved weeds and the effect on 8 common crops from applications both pre-emergence and postemergence of several chemicals. Other investigators reported results in individual abstracts. CDAA at 6 lb/A gave excellent control of annual grasses (except crab grass and wild oats) on muck. An unusual result was the striking control of common groundsel, prostrate pigweed, and redroot pigweed by 5 lb of CDAA. Satisfactory early control of Setaria with 3 lb/A of CDEA was reported but the toxicity of the chemical disappeared in about a month. Other satisfactory treatments were 6 lb of Dalapon, 6 lb of trichloropropionate, 6 lb of TCA, 4 lb of dichloral urea, 2 lb of Baron, and 1 lb of dimethyl urea applied preplanting or pre-emergence. The latter also controlled crabgrass. In postemergence treatments, Dalapon at 4 lb, trichloropropionate at 4 lb, and amino triazole at 2 lb applied to corn at layby were successful.

Five lb of 3,4-D killed mustard, the MCP amine and ester were inferior to 2,4-D esters and amines for Russian thistle, TCB at 1 lb controlled pigweed, purslane, lambsquarters, ragweed, smartweed and wild lettuce and 2 lb of TCB + 6 lb of CDAA resulted in complete kill. TCB at 6 lb prevented normal seed production of scented may weed. The ester of 2,4-D killed Silene cserei at 1½ lb/A.

Dalapon was more effective on downy bromegrass than TCA. October treatments were successful with 4 lb of Dalapon, 5 lb of Karmex FW, 10 lb of TCA, 8 lb of amino triazole, 320 lb of sodium chlorate, or 320 lb of Polybor chlorate. Spring treatments that proved satisfactory were Dalapon 4 lb + amino triazole 2 lb and amino triazole alone at 2 lb.

Phillips compared cultivation with 2,4-D and 2,4-D + Dalapon for summer fallow. Kommedahl studied the effect of light and 2,4-D on germination of pigweed seeds. Molberg determined losses in small grains from competition of wild mustard, stinkweed, and poverty weed.

Maleic hydrazide for selective sterilization of wild oats seeds in barley. Andersen, Robert N. and Helgeson, E. A. A split plot experiment with 4 reps was laid out in a field of Kindred barley heavily infested with wild oats (Avena fatua). Times of treatment (July 8 or 15, 1954) were main plots and rates and formulations of MH were sub-plots. MH 30 or MH 40 was applied at ½, 1, and 2 lb active material in 40 gallons of water/A. On July 8 the barley was in the milk stage and the wild oats were in the early milk stage. On July 15 the barley was in the soft dough stage and the wild oats were in the milk stage. Data on barley yields, tests weights, and germination were secured. Malting tests and other physical and chemical analyses were made by the USDA Barley and Malt Lab, Madison, Wisconsin. At harvest wild oats seeds were collected from the ground and from the panicles in all plots. An indication of viability was obtained by germinating the seeds in moist soil over a period of 100 days, after which "sound" seeds were recovered and allowed to dry out before being placed in a germinator for a further observation. Another set of wild oat seeds was stored dry at room temperature for 1 yr and then germinated on moist filter paper at 20°C. Results: Only the data from the germination tests on wild oats seeds stored dry for 1 yr are given here. Results from the other test showed excellent control from the treatments but the checks germinated only around 30%.

	Wild oats treated in the early milk stage (% germ)		Wild oats treated in the milk stage (% germ)	
	seeds from ground	seeds from head	seeds from ground	seeds from head
Check	70.5	64.8	62.5	66.8
MH 40 ½ lb	29.0	33.8	19.0	42.5
" " 1 lb	1.8	7.2	5.8	22.2
" " 2 lb	0.0	0.0	1.2	9.8
MH 30 ½ lb	6.8	11.2	31.0	51.8
" " 1 lb	0.8	1.2	4.5	18.2
" " 2 lb	1.4	0.8	0.8	12.8

Statistical analysis failed to show any effect of treatments or stages on barley yields or test weights. Barley germination was drastically reduced by rates of 1 and 2 lb of either formulation at either stage. However this damage was less severe in the latter stage. Malting quality was affected in a manner similar to that of germination. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture, and North Dakota Agr. Exp. Sta., Fargo, N. D.).

Fall vs. spring preplanting (disked in) treatments of IPC, TCA, and combinations for control of wild oats (Avena fatua). Andersen, Robert N. and Helgeson, E. A. An area heavily infested with wild oats was allowed to go to seed and was plowed 4-5 in. deep August 25, 1954. The area was disked October 22. A split plot design experiment with 5 replications was laid out with time of application of herbicides (fall or spring) as main plots and chemical treatments (IPC at 4, 8, and 12 lb active material/A; TCA at 4, 8, and 12 lb acid equiv/A; and 2 or 4 lb/A of each in combination) as sub-plots. Sub-plots were 15 ft sq and were bordered by a 3 ft buffer strip. The fall treatments were applied October 27, 1954 and immediately disked in to a depth of 4-5 inches once each way with a tandem disk. Spring treatments were applied May 2, 1955 and disked in as before. On May 2 sugar beets were planted in three of the replications and flax in the other two. Results: Wild oats stand counts made April 27, 1955 in the fall treated plots showed wild oat control of 82% for 12 lb of IPC, 79% for 12 lb of TCA, and 72% for the combination of 4 lb each. The initial control did not hold and all fall treated plots soon could not be visually distinguished from the checks. Of

the spring treatments only IPC at 8 and 12 lb gave important control. The control from 8 lb of IPC was classed as fair to good, while 12 lb gave very good to excellent control. Beets survived the 12 lb spring application of IPC. Flax did not. Only a few flax plants survived the 8 lb rate of IPC. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture, and North Dakota Agr. Exp. Sta., Fargo, N. D.).

Effect of various herbicides applied at several stages of growth to wild oats (Avena fatua). Andersen, Robert N. and Helgeson, E. A. A field of Fargo clay which had been infested with wild oats for several years was roto-tilled 6 in. deep early in the spring of 1955. On May 10 the area was cultivated. Sodium 2, 2-dichloropropionate (Dalapon) and sodium 2,2,3-trichloropropionate were applied at 2, 4, 6 lb acid equiv/A; alpha-chloro-N,N-diethylacetamide (CDEA) and alpha-chloro-N,N-diallylacetamide (CDAA) were applied at 3 and 6 lb active material/A in 20 gal aqueous mixture/A. Treatments were made May 20 (pre-emergence), June 14 (2-5 leaves 3-6 in. tall) and June 26 (10-13 in. tall). Results: Observations made July 18, when the wild oats in the check plots were heading follow. None of the materials used, with the exception of Dalapon, effectively controlled wild oats. The pre-emergence application of Dalapon did not satisfactorily control the wild oats. However, the plots receiving 4 lb of Dalapon were 16-28 in. tall, the plots receiving 6 lb were 16-24 in. tall and the checks were 36-40 in. tall. Some stand reduction was noted. Applications of Dalapon made June 14 resulted in near perfect initial control from 6 lb and excellent control from 4 lb. Some small plants, which it is believed emerged after treatment, were present in these plots on July 18. Two lb of Dalapon stunted the wild oats but did not give satisfactory control. Plants treated June 26 and observed July 18 measured 16-33 in. tall with slight reduction in heading from 2 lb of Dalapon. Plants treated with 4 lb were 16-24 in. tall with approximately 60% control of heading. Plants treated with 6 lb were 10-20 in. tall with 90% reduction in heading. The checks were 36-40 in. tall. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture and North Dakota Agr. Exp. Sta., Fargo, N.D.).

Growth of wild oats seedlings from parent plants treated with 2,2-dichloropropionic acid (Dalapon). Andersen, Robert N. and Helgeson, E. A. Wild oats seeds were collected from plants treated in the field in 1954 with sodium Dalapon. Treatments had been applied when the wild oats were in the boot stage and had apparently failed to prevent viable seed production. Preliminary germination tests showed little effect from treatments except a slight delay in germination. Seeds were planted in the greenhouse on March 2, 1955 and watered as needed. Data for seeds taken from plants in the field before shattering are shown below. Data are means of 2 lots of 100 seeds each. Shattered seeds which presumably were older at time of treatment showed responses similar to that shown below but to a lesser degree.

Rates of Dalapon in lb acid equiv/A	Emerged plants 3 weeks after planting	Total shoot height 3 weeks after planting	Average height per plant 3 weeks after planting	Normal plants present 4 weeks after planting
	no	cm	cm	no
0.0	82	776	9.3	82.0
4	67	57	0.8	1.0
6	78	85	1.1	0.5
8	62	53	0.9	1.0
12	62	80	1.3	2.5
16	66	63	1.0	0.0

Most seeds from treated plants produced only a coleoptile above ground and failed to develop further. The striking "carry-over" of herbicidal effect in normal appearing seeds seems to indicate the need for further study to determine if treatment with Dalapon in late stages of growth has any practical control value. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture, and North Dakota Agr. Exp. Sta., Fargo, N. D.).

Effect of various herbicides applied as pre-emergence and postemergence treatments on Setaria lutescens. Andersen, Robert N. and Helgeson, E. A. An area in a field of Fargo clay known to be naturally infested with Setaria lutescens was fitted as if in preparation for planting sugar beets. The last operation, a spike tooth harrowing, was completed May 16, 1955. On May 21 the pre-emergence treatments shown below were applied in 20 gallons of aqueous mixture/A. A total of 1.67 in. of rain fell in the week following treatment. Postemergence treatments were applied on June 23 to Setaria that ranged from emerging to 13 in. tall with most plants 4-6 in. tall. Vegetation was wet with dew at time of application. Results: All pre-emergence treatments gave good to excellent control of the Setaria. The estimated percent control (av. of 3 replications) based on the checks is shown for the pre-emergence treatments along with descriptive remarks for the postemergence treatments.

		Evaluation 1 month after treatment	
Treatment	Rate lb/A	Pre-emergence % control	Postemergence remarks
Check	0	0	No control
2,2-dichloropropionate (Dalapon)	2	68	Fair-good control
"	4	79	Excellent "
"	6	92	Excellent "
2,2,3-trichloropropionate	2	79	Slight "
"	4	90	Fair "
"	6	93	Fair-good "
Trichloroacetate (TCA)	6	92	Slight-fair "
Alpha-chloro-N,N-diethylacetamide (CDEA)	3	94	No "
"	6	98	No "
Alpha-chloro-N,N-diallylacetamide (CDAA)	3	96	No "
"	6	99	No "

The pre-emergence treatments all began to lose effectiveness approximately 1 month after application. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture, and North Dakota Agr. Exp. Sta., Fargo, N.D.).

Fall application of herbicides for the control of wild oats.

Breakey, W. J. Chemicals were applied October 6, on an area 300 x 345 ft divided into six plots 50 x 345 ft. Chemicals were applied crosswise on the six plots. Each treated plot had a check plot adjacent to it. Treated plots were 13x50 and the check plots 10x50 ft. In all 14 chemical treatments were applied. After spraying the chemicals were incorporated into the soil on 4 of the 6 areas the same afternoon. The first set of plots on the 50 ft area was disked 2 in. deep and packed. The second set was disked only. On the third and fourth sets the stubble was left with no cultivation. The fifth set was disked similar to set 2, while the sixth set was disked and packed similar to no. 1. This method provided duplicate plots and checks with three different after-spraying treatments for each set of two plots. Previous to spraying on one half the area (150 x 345 ft) the stubble was mowed, and the straw and cut stubble removed. On the other half area the stubble was left undisturbed, the straw having been baled previously. In May, strips of barley, corn, flax, sunflowers and soybeans were sown across the chemical treatments and checks. Results: IPC at 5 lb/A gave only partial control of wild oats and other weeds. At 10 and 15 lb/A, wild oat control was good to excellent. CIPC at 10 lb/A gave better control than the 10 lb rate of IPC. TCA at 10 lb/A gave about 50% control, at 20 and 30 lb/A practically 100% control. 2,4-D gave practically no control of wild oats at rates of 5, 10 and 15 lb/A. However, the 2,4-D applications suppressed most growth of broad-leaved weeds. 2,4-D amine was somewhat more effective than the ester in this fall application. 3,4-D applied at 4 lb/A gave good control of wild oats and broad-leaved weeds. All chemicals were applied in water at 5 and 10 gal per acre.

Part 2. The packing of the disked soil did not appear to add to the effectiveness of the chemical. Practically no wild oat growth was observed on any plots where the stubble was left either cut or untouched. On the disked check plots the wild oats were well above the soil surface in early May. Disking in late fall stimulated early and heavy germination. Plots treated with TCA suppressed growth of the annual crops sown in May, even though sowing was done at two week intervals. Areas treated with this chemical would have to be summerfallowed. Sunflowers showed some resistance to TCA. (Contribution of the Dominion Experimental Farm, Morden, Manitoba).

Maleic hydrazide applied to newly headed stands of wild oats in crops of barley and flax, 1954. Brown, D. A. Part 1. Applications of 1/6 lb active ingredient/A were made to crops at five stages of growth (1) Barley in milk; flax 70% in bloom; wild oats panicles emerging. (2) Barley late milk; flax 50% bolls; wild oats early milk. (3) Barley early dough; flax 75% bolls; wild oats milk stage. (4) Barley dough; flax bloom complete, 90% bolls; wild oats early dough. (5) Barley stiff dough; flax 100% bolls, seed early dough; wild oats early to late dough. Results: Barley seeds germinated normally when treated at early dough stage but only gave 20 to 40% germination at late dough stage. Flax germination was significantly reduced at all stages especially at full bloom and again when seeds were entering dough stage. Wild oats at early dough stage gave only 2% germination, while checks gave 64% stand. At earlier and later stages germination was reduced in most instances significantly.

Part 2. Included three rates of maleic hydrazide ($\frac{1}{4}$, $\frac{1}{2}$ and 1 lb/A) to wild oats in a crop of barley when in late milk to early dough; wild oats early to late dough. Results: Wild oats at 1 lb, 2%; $\frac{1}{2}$ lb, 4%; $\frac{1}{4}$ lb, 7%; check 67%.

Barley, all rates, 72%. Check untreated 84%. (Contributed by Experimental Farm, Brandon, Manitoba).

Soil treatment with IPC for control of wild oats. Brown, D.A. IPC was applied at 5, 10 and 15 lb/A active ingredient on Oct. 20/54, to soil heavily infested with wild oats. It was thoroughly worked in to a depth of 4 in. Wheat and barley were sown early (May 7) and late (June 6). Results: Percentage total stand of crop as wild oats; wheat early seeding, 5 lb, 6.3 %; 10 lb, 3.8; 15 lb, 1.7; check, no treatment 12.7%. Wheat late seeding; 5 lb, 1.5%; 10 lb, 2.1; 15 lb, 0.8; check 1.7%. Barley early seeding, 5 lb, 1.7%; 10 lb, 1.3; 15 lb, 1.1; check no treatment, 5.4%. Barley late seeding, 5 lb, 1.9%; 10 lb, 1.1; 15 lb, 0.9; check, 4.7%. Wheat yields from late sown plots were all significantly lower than from early seedings except at the 15 lb rate which yielded almost the same from both dates. At 15 lb early seeded wheat yielded significantly lower than at 5 and 10 lb but not significantly lower than the untreated check. The highest barley yield was from early seeded plots receiving the 15 lb application. This experiment is laid out on a three-year rotation of fallow, wheat, and barley and will continue for several years to measure the cumulative effect of IPC for the control of wild oats by late autumn applications to the soil. (Contributed by Experpmental Farm, Brandon, Manitoba).

Cultural treatments for control of wild oats using barley as a crop. Brown, D. A. Part 1. Treatments. (1) Fall cultivation and post seeding cultivation. (2) Fall cultivation, no post seeding cultivation. (3) No fall cultivation, post seeding cultivation. (4) No fall and no post seeding cultivation. Half the plots seeded May 6-10, the other half June 6-10. Prior to seeding all weed growth is killed by tillage. Results 1955: At the early date of seeding the percent stand of total crop as wild oats varied from 4.6 on plots cultivated in fall and rod weeded after seeding to 5.9% on plots receiving no cultivation in fall or after seeding. There was no significant difference, however, between any of the tillage treatments. Delayed seeding was the only factor significantly reducing the infestation of wild oats. This ranged from 0.2% following both cultivation in fall and again after seeding (rod weeder), to 0.4% on plots receiving no fall or after-seeding cultivation. The results in 1955 agree closely with those obtained in 1954, when this experiment began.

Part 2. Rates of seeding barley plus fertilizer. Treatments. $1\frac{1}{4}$ bu/A plus 60 lb/A 16-20-0; $1\frac{1}{4}$ bu/A no fertilizer; same procedure at $2\frac{1}{2}$ bu/A. Half the plots are seeded early, half late as in Part 1. The percentage of wild oats in the crop was significantly reduced both in 1954 and 1955 by delayed seeding but not by any of the other treatments. Barley yields were almost doubled in 1954 by early seeding. In 1955 late seeding did not significantly alter yield. (Contributed by Experimental Farm, Brandon, Manitoba).

Effect of competition of wild oats on yields of wheat, 1955. BBrown, D. A. Weed free summer fallow was used for this test. Wheat was seeded at a normal rate of 300 kernels per rod row. Competition was provided by drilling between the wheat rows, wheat, oats, and wild oats at rates from 100 kernels per row to 400. Results: Wheat free of competition yielded 41.4 bu/A. Competition of wild oats was comparable to that provided by wheat and tame oats. At all rates the competitive crops significantly reduced the yield of wheat. When competitive crops represented 22% of the total stand of crop the yield of wheat was reduced 15%. At the highest rate of competition, i.e. 57% of total crop stand, the reduction in wheat yield was 25%. (Contributed by Experimental Farm, Brandon, Manitoba).

Effect of 2,4-D on a stand of wild buckwheat not in crop. Brown, D. A. Wild buckwheat was seeded in a randomized series of four row plots May 20, 1955. Single treatments were applied at two stages of growth, the first at the second cotyledon stage, and the second when plants were 3 to 5 in. tall.

Herbicides used were Dows LV 10-10 ester; A.C.P. LV 4 ester, and 2,4-D standard butyl ester. Each was applied in single treatments at rates of 5, 8 and 12 oz/A. In addition an 8 oz application of each was made to which a spreader (Orvus) was added. An 8 oz/A rate was also used for two and three repeated treatments at intervals of one week. Results: Yields of plant material remaining three weeks after treatments were recorded and related to visual ratings of % control. The second date gave significantly better results than the first. Two applications gave equally good results as three. Five and 8 oz/A were not significantly different but the 12 oz rate was significantly better than the lower rates. Adding spreader did not alter results at the 8 oz rate. There was close agreement among the kinds of chemicals. Results slightly favoured the standard butyl ester but the difference was far from significant. None of the treatments approximated complete control of the weed as can be judged by the gram weights of material harvested. (Contribution from Experimental Farm, Brandon, Manitoba).

Relative resistance of redroot pigweed, lambsquarters and Russian thistle to 2,4-D. Brown, D. A. A uniform stand of these weeds not in crop was treated with Dows LV 10-10 ester, A.C.P. LV 4 ester and a standard butyl ester in June 1955, at rates of 4, 8, and 12 oz/A in single dosages; 8 oz/A plus a spreader (Orvus) in a single dose and 8 oz/A in two and three repeated dosages at 8 day intervals. The single dosages were applied at two dates. (1) when plants were 1 to 2 in. high and (2) eight days later when plants were 3 to 4 in. high. Results: Overall kill considering formulas, rates and stages of growth: Lambsquarters 96.3%; Redroot pigweed 78%; Russian thistle 46%. The two stages of growth gave no significant difference nor did the kinds of chemicals used. In fact, there was extremely close agreement in this respect. There was a wide significance in rates favouring 8 oz/A over 4 oz/A but not in single treatments of 8 and 12 oz. Addition of the spreader did not enhance results. Two repeated applications gave significantly better results than single dosages. Three applications were no better than two. (Contributed by Experimental Farm, Brandon, Manitoba).

The effect of different chemicals on scentless mayweed (Matricaria inodora). Carder, A. C. The following chemicals were applied to mayweed 8-12 in. tall or at the early summer rapid growth stage in water solutions at 80 gal/A: 2,4,5-T ester and 2,4-D butyl ester at 1, 2, 3, and 4 lb/A; Dalapon, chlorea (sodium chlorate + S. metaborate + CMU), and CMU at 2, 4, 6, and 8 lb/A; 2,3,6-trichlorobenzoic acid at 2, 4, and 6 lb/A; TCA, DB-spray powder (sodium chlorate + 2,4-D), and Ammate at 10, 20, 30, and 40 lb/A; and amino triazole at 2, 4, 6, and 8 oz/A. Plots were 1 sq rod and duplicated. The effects of the chemicals were appraised six weeks after treatment. Results: No chemical gave satisfactory control at the rates used. Most promising was the benzoic formulation which at 4 and 6 lb/A almost completely prevented proper seed formation though it had little effect on vegetative parts. Next most promising results were obtained by the use of ammonium sulfamate and CMU. The heavy rates of these chemicals caused severe "burning" to both flower and leaf but complete kill of these organs was not obtained. The next most effective chemicals were 2,4-D, TCA and 2,4,5-T, in the order named. (Contribution Experimental Farm, Beaverlodge, Alberta). Approved for publication.

The selective control of wild oats in cereal crops by use of maleic hydrazide. Carder, A. C. This experiment was carried out in 1954 but results were not available until 1955 due to the large number of germination trials involved. The experiment was first conducted in 1953 and the results of this work are abstracted in the research reports for 1954. In the experiment currently described MH was applied at ½ and 1 lb/A, active ingredient, in a water spray at the rate of 5 gal/A. Seven treatments at intervals of 2 to 4 days were made. Treatments were commenced when the wild oats were in early milk and continued until they were in firm dough. Four cultivated cereals selected for earliness and popularity were investigated. The results of the experiment confirm those of the 1953 trials except that Redwing flax did not offer the considerable degree of selectivity previously obtained. Results of both experiments may be summarized: 1) If treated in the milk, the germination of the seed of wild oats is reduced to about 1% by the application of as little as ½ lb MH/A. 2) The germination of the seed of the cereals under test, Olli barley, Redwing flax, Saunders wheat and Larain oats was also seriously impaired if MH was applied when these crops were in the milk. 3) The phasic development of Olli barley was sufficiently different from that of wild oats, however, to permit a high degree of selection, i.e., treatment could be made when the germination of the seed of the wild oats was virtually destroyed, while that of Olli barley was practically unaffected. 4) The phasic development of Redwing flax, Saunders wheat and Larain oats is not sufficiently different from that of wild oats to permit selectivity insofar as germination is concerned. 5) The yield of the cultivated crops was not reduced by MH where applied at the rate of ½ lb/A and at stages prescribed to destroy the germination of the wild oat kernel. (Contribution of Experimental Farm, Beaverlodge, Alberta). Approved for publication.

Relative competition between cultivated cereals and wild oats. Carder, A. C. To substantiate general observation concerning the relative ability of certain cereals to compete with wild oats, yield samples were taken in 1954 and 1955 from several dozen plots where the pertinent species competed. The results of this sampling are summarized in the table:

	Lb clean seed/A Av 2 yr	% wild oats* Av 2 yr	Bu seed/A Av 2 yr
Olli barley	878		18.3
Wild oats	188	21.3	5.5
Redwing flax	268		4.8
Wild oats	327	122.0	9.6
Saunders wheat	698		11.6
Wild oats	118	16.9	3.5
Larain oats	791		23.3
Wild oats	136	17.2	4.0

* Cult. cereal = 100

The data indicate that the grass cereals competed rather strongly with the wild oats, while flax did not. Apparently Olli barley offered strong competition to wild oats despite the fact that it is an excellent nurse-crop for forage seedings. Its unusual precosity is perhaps responsible in part for its suppressive action on wild oats. (Contribution of Experimental Farm, Beaverlodge, Alberta). Approved for publication.

Comparison of 2,4-D and 2,4,5-T sprays on chickweed. Corns, Wm. G. and Vanden Born, Wm. Esters of 2,4-D and 2,4,5-T were applied at 6 and 10 oz/A to chickweed in late flowering to early seeding stage in early August. 2,4-D caused no visible response while 2,4,5-T was only slightly better, being responsible for some twisting and stunting but no significant permanent damage to the plants. (Division of Crop Ecology, Dept. Plant Science, University of Alberta).

Comparison of various herbicides on wild buckwheat. Corns, Wm. G. and Vanden Born, Wm. Wild buckwheat and wheat seeded on May 12 provided separate test rows for treatments. 2,4-D, ester; MCP, ester; and MCP, amine were applied at 4 and 8 oz/A when the buckwheat had 4-6 leaves (June 14). In a second trial, 4 oz were applied June 14 and again 10 days later.

TCB, tri and tetra was used at 3 or 6 lb/A pre-emergence and at 1 or 3 lb when the buckwheat had 5-7 leaves. TCB at 0.5 and 1 lb/A was tried at the same stage.

Sodium arsenite at 1, 5, 10 or 20 lb in 20 gal/A and the same rates + 4 oz of 2,4-D/A were sprayed on buckwheat with 4-6 leaves.

CDAA, CDEA, and CDEC were tried at 3 or 6 lb/A pre-emergence and 1 or 3 lb postemergence (4-6 leaves).

SES at 2 or 4 lb/A and DB spray (2,4-D + borate) at 5 or 10 lb were used at the 5-7 leaf stage.

Results: Bird-damage prevented taking yields of wheat but it seemed clear that none of the treatments gave satisfactory practical results. Where reduction in buckwheat numbers occurred, the remaining plants grew more vigorously so that there was little or no net reduction in weight of weeds. The arsenite was the most effective on wild buckwheat but the rates are impractical. (Division of Crop Ecology, Dept. Plant Science, University of Alberta).

Effect of 2,4-D ester on Silene cserei. Craig, H. A. and Lee, W. O. A roadside, one mile south of Arden, Manitoba, heavily infested with Silene cserei in seedling stage, with occasional mature plants, was treated early June, 1955 by boom sprayer with 1½ lb 2,4-D, ester/A in 6 gal water. Soil texture - sandy, loam. Inspection made September 26th revealed 100% kill of both seedlings and mature plants. (Contribution from Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Manitoba). Approved for publication.

Wild oat control and crop tolerance studies with CDAA, CDEA, CDEC, and TCA. Dunham, R. S. and Soine, O. C. Pre-emergence applications at various rates were made to soil naturally infested with wild oats at the Northwest School and Station, Crookston, in the Red River Valley. CDAA, CDEA, and CDEC were used at 2, 4, or 6 lb/A and TCA at 5 lb/A. The tolerance of flax, barley, Chancellor peas, soybeans, and corn was determined. Results: In the flax, barley, and peas, there was no control of wild oats with 2 lb of any of the three herbicides. Poor control resulted from TCA and CDEC at all rates. At 4 lb CDEA gave good control; CDAA was somewhat less effective. At 6 lb CDAA gave good control. In corn and soybeans TCA gave no control; CDEC gave good control at 6 lb only; CDEA gave fair control at 6 lb; and CDAA was most effective with good control at 4 lb and fair control at 2 lb. The yields of crops were not significantly affected by any of the treatments. Germination was also unaffected with the possible exception of 6 lb of CDEC and 5 lb of TCA on flax where a small reduction may have occurred.

The herbicides were not incorporated with the soil. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3455 Sci. Jour. Series, Minn. Agric. Exp. Station).

Giant foxtail control in corn. Dunham, R. S., Robinson, R. G. and Jordan, L. S. TCA at 5 lb/A; Dalapon at 1, 1½, 2, and 2½ lb/A; and amino triazole at 2 lb/A were sprayed on the lower 6 in. of Minhybrid 507. TCA and Dalapon were applied at layby; amino triazole 8 days earlier when corn was 18 in. tall. The foxtail was less than 6 in. tall when sprayed. Results: All treatments gave satisfactory control and all except amino triazole injured the corn. Injury consisted of mal-formed ears and yield reduction. Greatest reduction resulted from Dalapon at 2½ and 2 lb/A. (Contribution from Department of Agronomy and Plant Genetics, University of Minn.; St. Paul, Minn. Paper No. 3446 Sci. Jour. Series, Minn. Agric. Exp. Station).

Application of MH to wild oat panicles and effect on germinability of seed. Ebell, L. F. and Corns, W. G. Rod row plots of wild oats were planted May 11, 1955. Plants emerged 12 days later. MH amine formulated with a wetting agent was applied at 0, 4, 8 and 12 oz/A in 25 gal. of water/A at 50, 57 and 64 days after emergence. The most advanced panicles were in the early kernel-forming, milk, and soft dough stages respectively at these dates. Considerable tillering occurred resulting in a range of differences in panicle age of at least three weeks. Samples were taken for germination tests on seed from panicles of various recorded ages. Germination tests have been completed on seed from intermediate and late panicles. Results: The 8 and 12 oz rates appreciably reduced germination of seeds from panicles of intermediate age at the last two dates of treatment and seed from late panicles at the last date of treatment. Germinated seed from effective treatments produced many seedlings that were weak and stunted and might not produce plants under field conditions. Seeds from early panicles not yet tested might conceivably be more seriously affected by treatment. Results show the difficulty of equally suppressing germination of wild oat seed in panicles of various stages of development. These differences would be less important under crop competition where fewer tillers and differences in panicle age would be expected. (Division of Crop Ecology, Department of Plant Science, University of Alberta, Edmonton, Alberta).

Effect of tillage and precipitation on wild oat control and crops injury from CIPC and alpha-chloro-N,N-diallylacetamide (CDAA). Ebell, L. F. and Corns, W. G. Part 1. On June 28, 1955 herbicides were used with tillage treatments with a hand pushed garden disker or with a rototiller. Four rows of wild oats and three rows of wheat were seeded the length of the 6 x 10 ft plots. Over two in. of rainfall occurred the week following treatment. Plant counts were made 76 days after seeding. Results:

Plant Count - % of check ($\bar{M}$ of 4 replicates).

	CDAA 5 lb/A		CIPC 10 lb/A	
Sequence of operations.	wild oats	wheat	wild oats	wheat
untilled-seeded before spraying	2	38	25	121
sprayed-rototilled- seeded	33	4	0	0
sprayed-disked 5 times-seeded	20	5	0	0
sprayed-disked once-seeded	23	19	10	9
untilled-seeded after spraying	26	23	30	36

Check = 100 L.S.D. at 5% wild oats = 13; wheat = 16

CIPC killed all wild oats and wheat when incorporated into the soil by rototilling or heavy disking and was progressively less effective when lightly disked, disturbed by seeding or undisturbed. CDAA proved about completely effective on wild oats when undisturbed and significantly less effective under all incorporation tillage. Wheat on the other hand was most vulnerable to well incorporated CDAA. This reversal of effect might be explained by the earlier germination of wheat and the movement of an undisturbed layer of chemical to the germinating wild oats by heavy rains four and five days after spraying.

Part 2. Further tests were conducted Aug. 29 with CIPC and CDAA both used at 5 lb/A. CIPC plots contained wild oats only. CDAA plots contained wild oats, wheat, barley and flax. Plots were handled as checks and with chemical undisturbed or incorporated by rototilling. The test was conducted in duplicate with one series left dry and the other heavily irrigated. Wild oats emerged in 9 days, about two days later than the cereals and flax. Results: Observations 20 days after seeding indicated little difference between wild oat control with CIPC at the two moisture levels but showed soil incorporation to give much superior control. On the dry CDAA plots the best control of wild oats was obtained by incorporation while at the high soil moisture level tillage was not advantageous. Wheat and barley showed little injury at either moisture level except when the CDAA was incorporated. Flax was severely injured by the incorporated chemical, especially under the high moisture level. A very close correlation was evident between rainfall occurring two weeks after spraying and control of wild oats in four experiments using CDAA (non-incorporated) and conducted throughout the season. Control with 5 lb/A of CDAA ranged from 20% with 0.4 in. of rain to 98% under 2.3 in. Under dry conditions higher rates and soil incorporation appeared necessary. (Division of Crop Ecology, Department of Plant Science, University of Alberta, Edmonton, Alberta). Approved for publication.

Residual and contact pre-emergence applications to wild oats and crops. Ebell, L. F. and Corns, W. G. Part 1. Half rod plots were planted to 4 rows of wild oats on May 11, 1955. Residual pre-emergence herbicides were applied 1 day later and contact pre-emergence herbicides 23 days after seeding when the wild oats were in the 2-3 leaf stage. Dalapon at 10 lb/A and alpha-chloro-N,N-diallylacetamide (CDAA) were applied both before and after weed emergence. Plant count and green weight data were obtained 72 days after seeding when most plants were fully headed. Results:

Plant Counts and Green Wts (expressed as % of check ($\bar{M}$ of 4 replicates).

Residual pre-emergence treatments				Contact pre-emergence treatments			
Herbicide	lb/A	Plant Count	Green Weight	Herbicide	lb/A	Plant Count	Green Weight
CIPC	10	34	38	MH amine	10	64	55
"	20	20	21	"	20	22	18
IPC	10	40	54	Amizol	10	51	30
"	20	29	36	"	20	29	5
Dalapon	10	90	10	Dalapon	5	106	32
"	20	67	3	"	10	117	12
CDAA	5	80	86	CDAA	5	114	104
"	10	45	78	"	10	86	102
TCA	25	76	70	DNBP in	5	82	108
	50	68	47	oil-water mixture	10	42	58

Check = 100% L.S.D. at 5% Plant Count = 18, Green Weight = 14

Dry soil conditions prevailing for one month after seeding reduced effectiveness of residual pre-emergence treatments. Only CIPC, IPC, MH, and Amizol at the 20 lb rate gave over 70% plant kill. CIPC gave somewhat better control than IPC and CDAA was not effective after emergence. Dalapon was equally effective at both dates of treatment at the 10 lb rate. While actual kill was low, plants were very seriously stunted by all Dalapon treatments and did not head. Amino triazole and MH effectively stunted plants and inhibited heading.

Part 2. A series of tests were conducted on farm sown fields of wheat, oats, and barley using CDAA at 0, 1, 2 and 4 lb/A applied before and after emergence. Flax and rape were treated with 0, 2, 4 and 8 lb/A before emergence, at the cotyledon stage and after several leaves had appeared. Possibly due to dry soil conditions residual pre-emergence treatment produced no visible injury to any crop. No visible injury occurred from contact pre-emergence treatments of oats, barley and rape while the 4 lb rate produced some tip burning and bronzing of wheat leaves with complete recovery in one month. 4 and 8 lb/A of CDAA applied to flax cotyledons and young leaves produced serious burning but later leaves were normal and the crop healthy. (Division of Crop Ecology, Department of Plant Science, University of Alberta, Edmonton, Alberta). Approved for publication.

Effect of tillage on broad-leaved weed control with alpha-chloro-N,N-diallylacetamide (CDAA). Ebell, L. F. and Corns, W. G. On June 28, 1955 CDAA was applied at 5 lb/A with various tillage treatments with a hand pushed garden disker and with a rototiller to study effect on sown wild oats and wheat. (Results appear in another abstract). Over two in. of rain fell during the week following treatment. A fairly uniform infestation of broad-leaved weeds appeared and such striking control with CDAA was evident that plant counts were made at time of weeding 45 days after spraying. Results:

Tabled Plant Count - 60 sq ft area ($\bar{M}$ of 4 replicates).

Sequence of original operations	Common groundsel	Prostrate pigweed	Redroot pigweed
untilled-seeded before spraying	1	8	11
sprayed-rototilled-seeded	2	20	19
sprayed-disked 5 times-seeded	7	4	20
sprayed-disked once-seeded	10	6	41
untilled-seeded after spraying	4	7	14
check-seeded only	49	159	76

All treated plots reduced the infestation of all three species significantly. Under the conditions of high soil moisture prevailing there was a trend towards better control of the more resistant redroot pigweed when soil was undisturbed after spraying. (Division of Crop Ecology, Department of Plant Science, University of Alberta, Edmonton, Alberta). Approved for publication.

Comparison of several herbicides applied in the fall for the control of wild oats. Friesen, George. During the fall of 1954 (from Oct. 6 to Nov. 9) eight experiments were laid out on farm fields in Manitoba for the purpose of comparing the effectiveness of several chemicals for the control of wild oats. The wild oat content of these fields varied from 735 to 6842 seeds per sq yd in the top 1 in. of soil. Fields at time of spraying varied from completely free of trash to a fairly heavy trash cover, and temperatures at time of spraying varied from 36° to 65°F. The chemical treatments compared in these experiments were: IPC at 5, 10, and 15 lb/A; CIPC at 10 lb/A; TCA at 10, 20 and 30 lb/A; Dalapon at 10 lb/A; 2,4-D, ester, at 5, 10, and 15 lb/A; and 2,4-D, amine, at 10 lb/A.

3,4-D at 4 lb/A was included in one of the experiments. Untreated check plots were adjacent to each treatment. Following the application of the herbicides one-third of each plot was disked and packed, one-third was disked only, and in the remaining portion of the plot the chemicals were left on the soil surface. During the spring of 1955 various crops, including cereals, were planted. Results with the various chemicals in these experiments can be briefly summarized as follows: IPC at 5 lb/A did not give satisfactory wild oat control. At 10 and 15 lb/A of IPC, control was good to excellent and only in two experiments was there residual toxicity at time of seeding cereals and flax. CIPC gave slightly better control than IPC at similar rates but there seemed to be longer residual toxicity on cereals and flax. With these two chemicals there was no residual effect on broad-leaved crops. TCA at 20 and 30 lb/A gave excellent control or suppression of wild oats. At 10 lb/A control was only fair. No crops survived in the plots where TCA had been applied. There were also indications that TCA only suppressed or delayed the germination and growth of wild oats since growth was normal after apparent leaching of the chemical from the soil. The results with Dalapon were inconsistent. 2,4-D gave virtually no control of wild oats, but broad-leaved crops were either killed or seriously damaged. The results with 3,4-D indicate that it warrants further testing; wild oat control was excellent and the cereal crops grew normally. With IPC and CIPC thorough soil incorporation was essential, no control of wild oats resulted where the chemical was left on the soil surface. Other chemicals gave similar control whether worked into the soil or not. A heavy trash cover seemed undesirable where IPC or CIPC was used since it interfered with the incorporation process. There seemed to be no benefit from packing the soil following the incorporation of the chemicals. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg, Canada).

Comparison of several acetamides and dithiocarbamates for the selective control of wild oats in several crops. Friesen, George. CDEA (alpha-Cl-N,N-diethylacetamide), CDAA (alpha-Cl-N,N-diallylacetamide), CDAA (2-chloroallyl diethyldithiocarbamate) and three coded dithiocarbamates (551E, 552I, 553T) were compared for the control of wild oats (*Avena fatua* L.). The experiment was conducted at Winnipeg on heavy clay loam heavily infested with wild oats. All chemicals were applied at 3 and 6 lb/A with the exception of 553T which was used at 4 and 8 lb/A. IPC at 6 lb/A was also included. Preplanting treatments were compared with pre-emergence treatments. In the former the chemicals were incorporated into the soil with a rotovator to a depth of 2 in. Results:

Treatment	Control of Wild Oats	Effect on Crops					
		Wheat	Oats	Barley	Flax	Corn	Potatoes
IPC - 6 lb/A*	exc	killed	killed	killed	killed	killed	retarded
" " **	poor	"	"	none	none	none	none
CDEA -3 lb/A*	good	none	none	"	"	"	retarded
" " **	fair	"	"	"	"	"	none
" 6 lb/A*	exc	thinned	thinned	"	"	"	retarded
" " **	good	"	"	"	"	"	"
CDAA -3 lb/A*	exc	killed	killed	"	thinned	"	none
" " **	none	none	none	"	none	"	"
" 6 lb/A*	exc	killed	killed	killed	thinned	"	none
" " **	good	none	none	none	"	"	"

* preplant ** pre-emergence

All other treatments gave no control of wild oats and caused no observable damage to the crops. Soybeans, peas, sugar beets, and sunflowers were not damaged in any of the plots in this experiment. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg, Canada).

Comparison of rotovator and double disc as a means of incorporating IPC into the soil for the control of wild oats (Avena fatua). Friesen, George and Canvin, D. T. IPC at 5 lb/A active ingredient, was applied to wild oat infested heavy clay loam soil at Winnipeg on May 19, 1955. On one-half of the treated area the IPC was worked into the soil with a rotovator to a depth of 2 in., while in the other half the herbicide was incorporated into the soil with a double (tandem) disc to the same depth. When compared with the untreated check, rotovating gave almost 100% control whereas double discing resulted in only 70% reduction of wild oats. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg, Canada).

The relative effect of IPC applied at three dates in the fall for the control of wild oats. Friesen, George. This experiment was conducted at Winnipeg on heavy clay loam soil heavily infested with wild oats. IPC was applied at three rates (4, 8, and 12 lb/A), and at three dates (October 8, October 22, and November 4, 1954). In one half of the experiment the current season's crop of wild oat seed was left on the soil surface while in the other half the wild oat seed was left on the soil surface while in the other half the wild oat seed was incorporated into the top 2-3 in. of soil before treatment. The plots were worked with a rotovator immediately after treatment so as to mix the chemical very thoroughly into the top 2 in. of soil. No crops were planted in the spring of 1955. Wild oat control in 1955 was similar where the seed had been left on the surface or incorporated into the soil prior to treatment. Results:

No. of wild oat culms/sq.yd. Counts made July 15, 1955

Treatment	Date of Application	Culms per square yard. Wild oat counts in treated plot	Wild oat counts in adjoining check.
IPC - 4 lb/A	Oct. 8	511	423
	Oct. 22	369	416
	Nov. 4	483	585
IPC - 8 lb/A	Oct. 8	385	400
	Oct. 22	319	378
	Nov. 4	25*	369
IPC - 12 lb/A	Oct. 8	17*	315
	Oct. 22	14*	405
	Nov. 4	12*	261

* Due to extensive tillering these counts represent only a few plants.

(Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg, Canada).

Effect of delayed incorporation of IPC on its toxicity on wild oats. Friesen, George and Canvin, D. T. IPC at 5 lb/A, active ingredient, was applied to wild oat infested heavy clay loam soil at Winnipeg on May 18, 1955. The chemical was incorporated into the soil to a depth of 2-3 in. with a rotovator at intervals of 1 min, 10 min, 1 hr, 8 hrs and 24 hrs after treatment. On the sixth plot the chemical was left on the soil surface. Wild oat control in all plots where the IPC had been incorporated into the soil was virtually 100%, even when rototilled after 24 hrs. The plot where IPC was left on the surface was undistinguishable from the untreated check, there being no control of wild oats. The experiment was conducted on a sunny, hot day with a temperature high of 81.6 degrees recorded. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg, Canada).

Effect of various herbicides in the control of wild oats, wild mustard and green foxtail in some special crops. Friesen, George and Smits, O. Wild oats (Avena fatua L.), green foxtail (Setaria viridis (l) Beauv.), wild mustard (Sinapsis arvensis L.), sugar beets, peas, soybeans, onions, potatoes, cucumbers, corn, and sunflowers were seeded in rows or strips on May 11 at Winnipeg on heavy clay loam. The following chemical treatments in 6 ft strips were made at right angles to the crops and weeds. Preplanting: IPC, 4 and 8 lb/A and CIPC, 4 and 8 lb/A. Pre-emergence: Baron, 2 and 4 lb/A; tetrachlorobenzoic acid (sodium salt), ½ and 2 lb/A; 3,4-D, 5 lb/A; and NP (sodium salt), 4 and 8 lb/A; Post-emergence: Dalapon, 2 and 4 lb/A; TCA, 4 lb/A; and Endothal at 4 lb/A. Results: IPC at both rates and CIPC at 4 lb/A gave excellent control of wild oats with no observable damage to sugar beets, peas, soybeans, and sunflowers. CIPC at 8 lb/A gave complete control of wild oats and fair control of wild mustard and green foxtail with no damage to sunflowers and soybeans. Dalapon at 2 and 4 lb/A gave complete control of green foxtail and fair suppression of wild oats and wild mustard at the 4 lb/A rate but seriously damaged all crops except sugar beets. TCA gave good control of green foxtail with no damage to sugar beets, onions, and potatoes, and only slight damage to peas, corn, and sunflowers. 3,4-D gave good control of wild mustard but seriously damaged or killed all crops except corn, potatoes, peas and soybeans. NP (sodium salt) at 4 and 8 lb/A gave fair to good control of green foxtail but seriously damaged all crops except cucumbers and soybeans. Baron gave good control of green foxtail without damaging potatoes and corn. Other chemicals did not give satisfactory control of weeds and in many cases seriously damaged the crop plants. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg, Canada).

Effect of various herbicides in the control of green foxtail in canning corn. Friesen, George and Smits, O. Canning corn (variety Sugar Prince) planted on May 18 at Winnipeg on heavy clay loam was heavily infested with green foxtail (Setaria viridis (L.) Beauv.). A few annual broad-leaved weeds and perennial sow thistle were also present in the plots. The following chemicals were applied on May 25 as pre-emergence treatments: CMU at 1, 2 and 4 lb/A; PDU at 2 lb/A and tetrachlorobenzoic acid (emul. oil and sodium salt) at 1 and 2 lb/A. Postemergence treatments of DNBP, amine salt, at 2 lb/A and Dalapon at 6 lb/A (directed spray) were made on June 30. Results: CMU at all rates and PDU gave good control of green foxtail. PDU and CMU at the 4 lb/A rate also gave complete control of all broad-leaved weed species present. CMU at the lower rates gave good control of all broad-leaved species except perennial sow thistle. Only the 4 lb/A rate of CMU caused some damage to the corn. Dalapon gave good suppression of green foxtail but also considerably damaged the corn. DNBP controlled the broad-leaved weeds but left green foxtail undamaged. All other treatments gave virtually no control of green foxtail and other weed species. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg, Canada).

Selective control of wild oats in cereal crops with MH 30. Friesen, H. A. and Walker, D. R. This project was conducted as three separate experiments in 1954, viz: effect of date of application, rate of application, and length of time required to eliminate wild oats from a given area with this chemical.

Exp. 1. MH 30 at 1 lb/A was applied in a water spray at 3 to 4 day intervals until 7 treatments had been made. Treatments were initiated when the wild oats were in the milk stage and continued until the firm dough stage had been reached. Results: Wild oat and wheat germination was largely destroyed at each date of spraying. Olli barley on the other hand, germinated reasonably well, especially at date 7, when the spray was applied to barley in the firm dough stage.

MH 30	Date	Wild Oats Growth Stage	% Germ W.Oats	Olli Barley Gr. Stage	% Germ Barley	Wheat Growth Stage	% Germ Wheat
1 lb/A	1	Milk	0	Milk	1	Seed formed	21
"	2	Milk	5	L.Milk	15	Milk	0
"	3	L.Milk	5	S.Dough	12	Milk	0
"	4	S.Dough	0	S.Dough	13	Milk	0
"	5	S.Dough	4	Dough	53	Milk	0
"	6	Dough	0	Dough	59	L.Milk	0
"	7	F.Dough	0	F.Dough	65	L.Milk	0

Exp. 2. MH 30 plus a wetting agent "Orvus" was sprayed on wild oats in Larain oats at dosages of 1/8, 1/4, 1/2, 3/4 and 1 lb/A. (1) when the wild oats were in the early milk stage and (2) in the soft dough stage. Results: Wild oats treated during the soft dough stage germinated from 0 to 4%, the higher rates being more effective. At the early milk stage only the 3/4 and 1 lb/A rates of MH 30 reduced the germination to a satisfactory level, namely 3 and 0% respectively. The germination of the Larain oats was affected in essentially the same way.

Exp. 3. In 1954 a 2 acre plot, which carried a heavy natural wild oat infestation, was sprayed with MH 30 at 1 lb/A plus a wetting agent when the wild oats were in the milk stage. This procedure was repeated on the same area in 1955 and it is intended to repeat this spraying until the wild oats in this plot have been eliminated. The plot will be cropped to barley continuously during this time. The MH 30 treatment in 1954 reduced the wild oat germination to 22% of normal. However, in 1955 there was no measurable difference in the wild oat infestation on the treated area as compared with the surrounding untreated area, each carried a very heavy infestation. (Contributed by the Experimental Farm, Lacombe, Alberta).

IPC, cyanamid, and delayed seeding for the control of wild oats in Olli barley. Friesen, H. A. and Walker, D. R. On September 28, 1954, cyanamid (21% N_2) was applied at rates of 0, 100 and 400 lbs/A to plots in an oat field which carried a heavy natural infestation of wild oats. On the same day IPC at 5, 10, and 15 lb/A was sprayed across the cyanamid treatment and the entire area double disked twice. In the spring of 1955 the entire area was one-way disked and one-half of each plot was sown to barley on May 12, the remaining 1/2 of each plot was cultivated again and sown to barley on June 6. Results: IPC at 5 lb/A, with or without the cyanamid, at the May 12 seeding resulted in some reduction in the number of wild oat plants but did not affect the green weight of this weed. IPC at 10 and 15 lb/A reduced the number of wild oat plants by 80-90%, however, the surviving plants, especially on the fertilized portions, were more vigorous and green weights were only reduced by 50%. The stand and yield of barley was not materially affected by 5 lb/A of IPC; 10 lb/A of IPC slightly reduced the stand of

barley but increased the yield; while IPC at 15 lb/A seriously reduced both the stand and yield of the barley. At the June 6 date of seeding the growth vigor of both the wild oats and the barley was markedly improved. The additional pre-seeding tillage reduced the number of wild oat plants by 50%. This number was reduced by a further 50% when treated with IPC at 10 and 15 lb/A. Green weights of wild oats followed a similar trend but were higher than those noted at the May 12 seeding. Barley yields, on the other hand, were greatly increased on these plots. IPC at 5 lb/A had no measurable effect on either the wild oats or barley. (Contributed by the Experimental Farm, Lacombe, Alberta).

Pre-emergence applications of acetamides, carbamates, and propionates for the control of wild oats in Olli barley. Friesen, H. A. and Walker, D. R. The plot area carried a heavy natural infestation of wild oats in 1955 and for many years previous. It had been cropped to wheat in 1954, seedbed preparation in 1955 consisted of one-way disking and harrowing. Wild oat and volunteer grain seedlings were emerging at the time of this tillage. The herbicides were applied immediately after the harrowing, and the land was double disked. Barley was seeded on the same day as the spraying was done. The herbicides and dosages applied were as follows: acetamides (under code numbers) 553T and CDEC at 2, 4 and 8 lb/A; 552I, 551E at 1, 3 and 6 lb/A; CDAA and CDEA at 1, 2 and 4 lb/A; Dalapon at 5, 10 and 15 lb/A; trichloropropionate (6249) at 4 and 8 lb/A; carbamates Niagra Nos. 5518 and 5519 each at 2, 4 and 8 lb/A. Results: None of the 6 acetamides measurably affected the number of plants or green weight of either wild oats on barley, nor did they affect the yield of barley. This was also true of the carbamate compounds 5518 and 5519. The trichloropropionate at 8 lb/A largely eliminated the barley but did not affect the wild oats. Dalapon at each dosage eliminated most of the wild oats and the barley. (Contributed by the Experimental Station, Lacombe, Alberta).

Herbicides for the control of Tartarian buckwheat in grain crops. Friesen, H. A. and Walker, D. R. Part 1. A four replicate trial of various herbicides was laid down in a field of wheat heavily infested with Tartarian buckwheat at Alix, Alberta. The initial spraying was done when the buckwheat had 5 to 6 leaves and the wheat had a full four leaves. A second spraying was made 18 days later on three of the treatments. Unfortunately, the test was located on soil of highly variable texture. Hence, the advent of a spell of very hot weather in July caused large variations in both weed and crop growth and the data obtained were largely of an observational nature. Results: 2,4-D, low volatile ester, at 4 oz/A with retreatment at 4 oz/A 18 days later; 2,4-D, low volatile ester, at 6 oz/A single application and 2,4-D, ester, at 6 oz/A with retreatment at 4 oz/A resulted in a marked reduction in both numbers of plants and dry weight of buckwheat. Dry weights were 85, 277 and 538 lb/A, respectively, while the untreated plots produced 1026 lb/A. Yield of wheat was markedly increased only where the single treatment of LV at 6 oz/A was used. 2,4-D, ester, at 8 oz/A was apparently less effective in killing and stunting the buckwheat than the LV at 6 oz/A but it did increase the grain yield. MCP, ester, and MCP, low volatile ester, were even less effective than the 2,4-D, ester, however, they did improve the yield of wheat. 2,4-D, amine, at 8 oz/A had no appreciable effect. Mixtures consisting of 2,4-D, ester, plus CMU at 1, 2 and 4 lb/A resulted in spray pattern distortions and streaky appearing plots. HC 1281 (polychlorobenzoic acid) at 16 oz/A gave very promising control of the buckwheat but largely eliminated the wheat.

Part 2. In 1955 three demonstration trials were set out in Northeastern Alberta. In a field strip trial at Two Hills the 2,4-D, ester, at 6 oz/A sprayed on wheat infested with Tartarian buckwheat resulted in a si nificant yield increase of wheat. 2,4-D, amine, or 2,4-D low volatile ester, applied at 6 oz/A

increased the wheat yield, but not significantly. In a similar test at Lamont, suppression of the buckwheat was very pronounced. However, a combination of treatment effect with extreme heat and drought during the latter part of June is presumed to have caused severe sterility, which greatly reduced the wheat yield where treated with 2,4-D, ester, at 6 oz/A or 2,4-D low volatile ester at 6 oz/A retreated at 4 oz/A. Double sprayings with 2,4-D, amine, or MCP, ester, at 6 oz/A and again at 4 oz/A did not depress the yield but considerable sterility was noted. At Lamont MCP, ester; 2,4-D, ester or LV ester at 4 oz/A retreated at 4 oz/A or 2,4-D amine plus 1 lb/A CMU resulted in an estimated 70-80 kill of buckwheat in barley with severe stunting of the surviving plants. Yield samples of barley taken did not show an increase over the untreated, although the barley, with the exception of 2,4-D, amine, plus CMU mixture, did not appear to be injured. (Contributed by the Experimental Farm, Lacombe, Alberta.)

2,4-D vs MCP for the control of annual weeds in oats. Friesen, H. A. and Walker, D. R. MCP, butyl ester, amine and sodium salt; and 2,4-D butyl ester, alkanolamine and low volatile propylene glycol ether ester (Dows 1010) each at 4 and 8 oz/A were sprayed on annual weeds in Eagle oats at two growth stages; (1) when the weeds were in the advanced seedling stage and the oats had 3 to 4 leaves and average height of 6 inches and (2) when stinkweed was in the rapidly growing stage just prior to budding, while the oats were well tillered but the flag leaf had not yet emerged. The weed population showed much variation between but not within replicates. On three of the six replicates hemp nettle (Galeopsis tetrahit) was by far the most prevalent, the average stand being 400 plants/sq yd. Stinkweed (Thalspi arvense) was present on all plots to the extent of some 50 plants/sq yd while other species such as ball mustard (Neslia), lambsquarters (Chenopodium) and Russian pigweed (Axyris) averaged 75 plants/sq yd on all plots. Results: Plant counts and dry weight of weeds at flowering time showed that each of the treatments resulted in kills of Thalspi, Neslia, Chenopodium and Axyris at each of two spraying dates. Galeopsis proved highly tolerant to each treatment of 2,4-D amine, butyl ester or low volatile ester. The MCP formulations at 8 oz/A, at the first date of spraying, killed some 25 percent of the Galeopsis plants and stunted the remainder to the extent that dry weight of the weeds was less than 50% of the untreated check. With the exception of MCP, ester, none of the MCP formulations at 4 oz/A resulted in an appreciable reduction in dry weight of Galeopsis. At the second date of spraying the MCP formulations were somewhat less effective on Galeopsis. The suppression of the Galeopsis, Thlaspi and other species by the MCP formulations at 8 oz/A was reflected in the higher yields of oats following these treatments at each date of spraying. The 2,4-D amine, ester, and low volatile ester due to their failure to suppress the Galeopsis and their adverse effect on the oat crop depressed the yield seriously at each spraying date, particularly so at date 2. It was of particular interest to note that on the 3 replicates in which Galeopsis was not prevalent and the weed control following each treatment was nearly complete the MCP treated plots outyielded 2,4-D ester, amine, and low volatile ester treated plots by a wide margin.

This same project was conducted in 1954. The reaction of the weed species to the various formulations followed a closely similar trend to that of 1955. The infestation of Galeopsis in 1954 was considerably lighter and the degree of suppression obtained with MCP formulations appeared greater - which was reflected in highly significant yield increases. In 1955, the Galeopsis was so dense on three of the replicates that growth of weed was considerably stunted on both the treated and untreated plots. This would largely account for the somewhat less striking results obtained from the use of MCP this year. (Contributed by the Experimental Farm, Lacombe, Alta).

Herbicide screening trial. Jordan, L. S. and Dunham, R. S.

Herbicide and rate/A,lb.	Weed Control Grass	Weed Control B.L.	Crop injury Oats	Barley	Flax	Peas	Corn	Soy.	Sunfl.	Alf.
			Herbicides applied pre-emergence							
CDAA, 4	exc	poor	0	0	0	0	0	sli	0	0
" , 8	"	"	"	"	"	"	"	"	"	"
CDEA, 4	"	"	"	"	"	"	"	"	"	mod
" , 8	"	"	"	"	"	"	"	"	"	0
CDEC, 4	poor	"	"	"	"	"	"	"	"	sli
" , 8	"	"	"	mod	mod	"	"	"	"	0
TCB, tri & tetra, 3	"	exc	sev	sev	sev	mod	mod	sev	sev	sev
" " " , 6	"	"	"	"	"	sev	sev	"	"	"
TCB, tetra, 3	"	"	"	"	"	mod	mod	"	"	0
" " , 6	"	"	"	"	"	sev	sev	"	"	sli
TCB, tri, 2	"	fair	"	"	"	"	sli	"	"	sev
" " , 4	good	exc	"	"	"	"	mod	"	"	"
" " , 6	exc	exc	"	"	"	"	"	"	"	"
Triazine, 8	poor	good	sli	mod	"	sli	"	"	"	sev
NaTCP, 6	exc	poor	0	"	mod	sev	sev	"	mod	0
" , 10	"	"	"	"	"	"	"	"	"	"
Dalapon, 6	good	"	mod	sev	"	0	"	"	sev	mod
" , 10	exc	"	"	"	sev	sev	"	"	"	"
Amino triazole, 4	poor	"	-	mod	"	-	mod	mod	mod	sev
" " , 8	"	"	-	sev	"	-	"	sev	"	"
TCA, 6	"	"	0	sli	0	0	0	mod	0	0
" , 10	"	"	"	mod	mod	mod	sev	sev	mod	"
			Herbicides applied post-emergence							
CDAA, 2	poor	poor	0	mod	0	0	0	0	0	0
CDEA, 2	"	"	"	0	"	"	"	"	"	"
CDEC, 2	"	"	"	"	"	"	"	sli	"	"
TCB, tri & tetra, 1	"	"	sev	sev	sev	sev	sev	sev	sev	"
" " " , 3	"	fair	"	"	"	"	"	"	"	mod
TCB, tetra, 1	"	"	"	"	"	"	mod	mod	"	0
" " , 3	"	"	"	"	"	"	sev	sev	"	sev
TCB, tri, ½	"	mod	"	"	"	"	0	mod	mod	mod
" " , 1	"	exc	"	"	"	"	"	"	sev	sev
" " , 2	"	"	"	"	"	"	"	sev	"	"
Trazine, 3	"	good	sli	mod	mod	mod	mod	"	mod	0
NaTCP, 2	exc	poor	"	"	0	sev	"	"	"	"
" , 4	"	fair	"	sev	sev	"	sev	"	"	sev
Dalapon, 2	"	poor	mod	"	0	"	"	"	"	0
Amino triazole, 2	"	exc	-	"	sev	"	"	"	sev	sev
TCA, 5	"	poor	0	"	0	"	"	"	mod	0

A few germination tests were made on the flax, barley and oat seed harvested from some of the plots. There seemed to be a slight reduction in viability of the flax harvested from the TCB plots. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. , Sci. Jour. Series, Minn. Agric. Exp. Station).

Germinability of seeds formed after foliage sprays of Maleic Hydrazide. Hay, J. R. This project was started in 1952 and continued in 1955. Oats, barley, flax and wild oats were sprayed this year with 4, 8 and 16 oz MH/A at 6 stages of growth. Yields, in grams per 100 heads, were not reduced by the treatment except when flax was sprayed at late flowering and perhaps oats when sprayed in the early shot blade stage. The germination of wild oats dropped from 78% for the checks to 3 and 2% when sprayed at 8 and 16 oz of MH in the milk stage. This confirms results of 1953 and 1954. There appears to be a period of 4-7 days when this result can be obtained. Prior to the germination test the seeds were exposed to routine methods of breaking dormancy so that the drop in germination is probably not due to an induced dormancy. (Central Experimental Farm, Ottawa).

Control of downy bromegrass (Bromus tectorum) in alfalfa. Keyser, H. R. Quadruplicate plots were established in a 4th year alfalfa field heavily infested with downy bromegrass. The field was sprayed April 14, 1955 with Dalapon (sodium salt of 2,2-dichloropropionic acid) at 4 and 6 lb/A and sodium TCA at 5 and 7 lb/A. The downy bromegrass was from 2-6" (leaves fully extended) and the alfalfa was 2-3" tall. Only .62" of rain was received the month following application. Results: Dalapon at 4 and 6 lb/A gave 84 and 95% control respectively; sodium TCA at 5 and 7 lb/A gave 16 and 45% control respectively. Neither of the chemicals injured the alfalfa or reduced the stand. (Contribution of Nebr. Dept. of Agri. and Inspection, Div. of Noxious Weeds, Lincoln, Nebr., and Univ. of Nebr. Expt. Sta, North Platte, Nebr.).

Control of downy bromegrass, (Bromus tectorum). Keyser, H.R. Triplicate 5 1/3' x 20' plots of a heavy stand of downy bromegrass were treated April 15, 1955 with Dalapon (sodium salt of 2,2-dichloropropionic acid) at 4 and 6 lb/A, Amizol (3-amino-1,2,4-triazole) at 2 lb/A, Amizol at 2 lb/A plus Dalapon at 4 lb/A, and Amizol at 2 lb/A plus Dalapon at 6 lb/A. All the chemicals were applied in water at the rate of 40 gal/A. The downy bromegrass was 1-5" tall (leaves fully extended) at the time of treatment. Only 1/2" of rain was received in the month following treatment. Percent control was estimated May 25, 1955. Results: Dalapon at 4 lb/A plus Amizol at 2 lb/A gave 99% control. Dalapon at 6 lb/A plus Amizol at 2 lb/A gave 100% control. Dalapon at 4 and 6 lb/A gave 48 and 85% control respectively. Amizol at 2 lb/A gave 96% control. The Dalapon and Amizol combinations were extremely effective; results showed in a week after application. Dalapon at 4 lb/A suppressed the growth of downy bromegrass; however, seed heads were formed. The effects of Amizol at 2 lb/A showed five days after treatment. However, some plants recovered and produced seed which did not appear to be filled. (Contribution from the University of Nebraska Experiment Station, North Platte, Nebraska and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska).

Variation among seed lots of wild oats in germination, hull color, grain size and microflora. Kommedahl, Thor. Thirty-two seed lots of wild oats (Avena fatua L.) from Minnesota, Montana, and North Dakota contained from 40 to 95% (average 68% grains with dark colored hulls. Dark and light hulled grains, 100-200 from each seed lot, were germinated in Petri plates, 20 grains per plate. Hull color, or characters associated with it, apparently was not a factor in germination; 36% of dark hulled grains germinated and 34% of light hulled grains. Large grains germinated better than small ones (47 and 53% germination, respectively, for large dark and light hulled grains as compared with 29 and 28%, respectively, for small ones). In 12 seed lots germination increased from 8 to 62% when hulls were removed. In 16 seed lots grains soaked in water for 1 hour germinated 41%, but similar grains dehulled, then soaked, germinated 73%. Soaking grains in water under vacuum was detrimental to germination. Grains germinated 7% when soaked in water for 1

hour under vacuum but germinated 50% when dehulled and treated in the same way. Dark and light hulled grains were about equally infected with fungi, and the number of infected seed was not related to percentage germination. An average of 75% of the grains in 32 lots was infected with Alternaria spp. and 6% was infected with Helminthosporium spp. The latter grew from 50% of the grains of some lots. (Dept. of Plant Pathology and Botany, University of Minnesota, St. Paul, Minn. Paper No. 3422, Sci. Jour. Ser, Minn. Agr. Exp. Sta.).

The effect of some chemicals on buckwheat (Polygonum convolvulus). McCurdy, E. V. Buckwheat was sown with wheat in replicated plots and treated with two low volatile esters, LV-4 and 10-10 at 4 and 6 oz/A, an ester of 2,4-D at 4 oz/A, MCP Amine at 4 and 6 oz/A, Heyden 1281 at 4 oz/A, Phenoxylene at 6 oz/A and DB Spray Powder at 4 lb/A. Because of continuous wet weather treatment had to be delayed until the buckwheat was 4 to 6 in. in height. Results: The 10-10 at 4 oz retarded growth and at 6 oz resulted in a definite delay. The LV-4 at 4 oz caused some distortion and stoppage of growth but at 6 oz the tips of the plants were browned, growth was retarded and fair control was accomplished. The ester of 2,4-D, the amine of MCP, Heyden 1281 and Phenoxylene caused a very slight setback but the plants soon recovered and resumed growth. At the rates applied little was accomplished. The injury with DB Spray Powder was slightly more severe but not enough to prevent regrowth. (Contributed by the Experimental Farm, Indian Head, Sask., Canada).

Cultural and cropping practices to control wild oats. McCurdy, E. V. A project was designed in 1952 to test 3 cultural methods for wild oat control. Fall cultivation was compared with no fall cultivation, early seeding with late seeding, and rod weeding after the crop was sown with no cultivation. These three cultural methods were tested in all possible combinations. Barley has been sown continuously and hence, the light crop has offered little competition to the wild oats. Results: Wild oat numbers have not been reduced by fall cultivation in this project. When the crop was sown at the normal date a gradual increase in the number of wild oats per plot has occurred. Where delayed seeding has been practised the wild oat count is about the same as when the project was started. A slight increase was noted last year but the number decreased in 1955. If summerfallowing had been included in the cropping practice quite a decrease should have been noted. Because of wet weather after the crop was sown, the rod weeder could not be used effectively. As a result postseeding cultivation has not been carried out during the past three years. In a project dealing with rates of sowing barley a 3 bu/A rate was compared with 1½ bu/A. The heavy rate greatly suppressed the number of wild oat plants. When 50 pounds of fertilizer was applied the wild oats were further reduced. (Contributed by the Experimental Farm, Indian Head, Sask., Canada).

Chemical control of wild oats when the chemicals were applied in the summerfallow year. McCurdy, E. V. Chemicals were applied to one group of summerfallow plots in August 1954, and to another group in October. These plots were split in the spring of 1955 and one half of each plot was sown to barley and the other half was left undisturbed. All rates referred to are based on active ingredients. Results: CMU when applied at 10 lb/A in August prevented all growth on the plots and when applied at 5 lb/A reduced the number of wild oats and eliminated all mustard. The barley in these plots was not a normal color. Endothal applied at 6, 8 and 12 lb/A at the early date had no effect on wild oats but when this chemical was applied in October at 12 lb/A wild oats were slightly reduced in number and mustard was completely eliminated. CIPC was applied at 15, 20 and 30 lb/A at both dates. This chemical gave excellent control of the wild oats at the 20 and 30 lb

rate and about 50% reduction at 15 pounds. IPC at 15, 20 and 30 lb/A at the early date was of little value, except for a slight reduction at 30 lb. When the chemical was applied in October, 15 lb/A gave some control, and 20 and 30 lb excellent control. TCA at 5 lb/A was of little value but when applied at 20 lb/A in August definite thinning was noted and when applied in October wild oats were almost eliminated. CMU had a serious effect of the growth of barley sown this year and TCA thinned the crop but on all other plots the barley was normal. (Contributed by the Experimental Farm, Indian Head, Sask., Canada).

The use of some chemicals for pre-emergence control of wild oats. McCurdy, E. V. In the spring of 1955 a number of experimental carbamates, a-chloroacetamides and dithiocarbamates were applied to some plots known to be severely infested with wild oats. These plots were disked immediately after the chemical was applied and were sown to flax some days later. After the crop had emerged very heavy rains flooded some of the plots. This retarded the growth of the crop and made the results difficult to interpret. Two carbamates, 5518 and 5519 were applied at 4 and 8 lb/A (active ingredients). Results: At 8 lb/A the flax was thinned and the wild oats were quite noticeably reduced in number, more with the 5518 than with the 5519. The 4 lb/A rate was not heavy enough to be effective. CDAA at 2 and 4 lb/A slightly reduced the number of wild oats but the results were very variable from plot to plot. The same applied with 3 lb/A of CDEC but at 6 lb/A the reduction was quite noticeable on all plots. CDEA at 3 lb/A only slightly thinned the wild oats. Considering the group as a whole this year, the CDEC at 6 lb/A of active ingredients and the 5518 at 8 lb/A resulted in a consistent reduction but in no case was this large enough to be considered effective in control. (Contribution of the Experimental Farm, Indian Head, Sask., Canada).

Losses due to wild mustard competition. Molberg, E. S. During the 9 years 1934 to 1942 the yields of wheat, oats and barley from weed free plots and from plots with varying amounts of wild mustard were recorded. Results: The average reductions in yield caused by the wild mustard (Sinapis arvensis), expressed in per cent were as follows:

	% reduction in yield when wild mustard constitutes		
Crop	1-20% of the crop	21-40% of the crop	41-60% of the crop
wheat	15	35	53
oats	14	46	63
barley	11	49	69

(Contributed by the Experimental Farm, Regina, Sask.).

Losses due to stinkweed competition. Molberg, E. S. During the 6 years 1937 to 1942, the average yields of wheat from plots with varying degrees of stinkweed (Thlaspi arvense) infestation were as follows: No weeds 32.6 bu/A, medium infestation 20.9 bu/A, heavy infestation 16.1 bu/A. (Contributed by the Experimental Farm, Regina, Sask.).

Losses due to poverty weed competition. Molberg, E. S. In 1934 the average yields of wheat from plots with different degrees of poverty weed (Iva axillaris) infestation were as follows: no weeds 17.7 bu/A, 11 weeds/sq yd 12.7 bu/A, 24 weeds/sq yd 8.2 bu/A. (Contributed by the Experimental Farm, Regina, Sask.).

Losses due to Canada thistle competition. Molberg, E.S. In 1934 the average yields of wheat from plots with different degrees of Canada thistle (Cirsium arvense) infestation were as follows: no weeds 34.4 bu/A, 2 weeds/sq yd 28.2 bu/A, 19 weeds/sq yd 12.1 bu/A. (Contributed by the Experimental Farm, Regina, Sask.).

Rates for applying MH for wild oats. Molberg, E. S. and Leggett, H. W. MH was applied to wheat, oats, barley and flax at rates of $\frac{1}{4}$, $\frac{1}{2}$, and 1 lb/A in 1954. The chemical was applied when the wild oats reached the milk stage. The average germination of the wild oats was 24.0% for the $\frac{1}{4}$ lb rate, 0.75% for the $\frac{1}{2}$ lb rate, 0.25 for the 1 lb rate, and 17.8% for the untreated check. Corresponding results from the $\frac{1}{4}$, $\frac{1}{2}$, 1 lb/A and check plots for the germination of the crops were as follows: wheat 97.5, 91.5, 26.5 and 96.0%. Oats 68.0, 3.0, 1.0 and 88.0%. Barley 99.0, 97.5, 95.5 and 99.0%. Flax 75.5, 60.0, 56.0 and 82.5% respectively. Hence, the $\frac{1}{4}$ lb rate was ineffective on wild oats. The $\frac{1}{2}$ lb rate was almost as effective as the 1 lb rate, and did much less harm to the wheat crop. (Contributed by the Experimental Farm, Regina, Sask.).

Comparison of formulations of MH for wild oats. Molberg, E. S. and Leggett, H. W. Three formulations of MH were compared in 1954. These were (1) 30% liquid amine containing a wetting agent, as supplied by Naugatuck Chemical Company, (2) same as (1) but 1 teaspoonful/gal wetting agent (Orvas) added, and (3) sodium salt powder which contains a wetting agent. These were applied at 1 lb/A to wild oats growing in flax, when the flax had just finished blossoming. The wild oats and flax were subsequently tested for germination. Results: Germination of wild oats was sharply reduced by all treatments, but the chemicals had relatively little effect on the germination of the flax. The liquid amine gave slightly better results than the sodium salt powder, and the extra wetting agent in treatment (2) increased the effectiveness of the liquid amine very slightly. These differences were not statistically significant. The germination of the wild oats and flax were as follows. The figure in brackets is for flax. Formulation (1) 14.4% (63.2%) (2) 14.0% (64.2%) (3) 18.9% (64.6%) Check, no MH 64.1% (66.9%). (Contributed by the experimental Farm, Regina, Sask.).

Selective control of wild oats with MH. Molberg, E. S. and Leggett, H. W. MH was applied at 1 lb/A to wild oats in wheat, oats, barley and flax at 4 dates in 1954. The first application was made when the wild oats were in the milk stage. At this time, the wheat was in the late milk, the oats and barley in the early milk, and the flax in the late blossom stage. Subsequent treatments were made at intervals of 3 days. Germination tests were made of the wild oats and crop seeds from the treated plots and from untreated check plots. Results: All MH treatments reduced the germination of the wild oats and crops. The germination of the wild oats was 74.7% when not treated, and 3.5, 4.6, 14.2 and 49.2% respectively for treatments made on dates 1 to 4 respectively. The wheat germinated 94.5% when not treated, and 5.7, 28.2, 51.0 and 54.0% for treatment dates 1 to 4 respectively. The oats germinated 46.1% where not sprayed, and 2.9, 0.2, 3.2 and 0.1% when sprayed on dates 1 to 4 respectively. The barley germinated 43.5% when not sprayed and 24.8, 18.1, 29.9 and 30.2% when sprayed on dates 1 to 4 respectively. The flax germinated 66.9% when not sprayed and 50.7, 45.4, 58.2 and 53.4% when sprayed on dates 1 to 4 inclusive. (Contributed by Experimental Farm, Regina, Sask.).

Effect of temporary soil sterilants on wild oats. Molberg, E. S. and Leggett, H. W. A wide variety of chemicals was applied at different times during the summerfallow year to plots 8' by 10' in four replications which were one-way disked and packed immediately after spraying. Treatments were made in the fall of

1953 and in the spring and fall of 1954. Crops were planted on these plots in 1955. Results: Endothal at 16 lb and CIPC at 48 lb/A applied in the fall of 1953 prevented all wild oat growth until after July 1, 1954. 10 lb MH, 10 lb IPC and 12 lb CIPC applied at the same time showed only 20 to 30% reductions in wild oats. In 1955 there was a heavy infestation of wild oats on all these plots, and the chemicals had no effect on the stand of wheat, oats, barley or flax. Of the chemicals applied in the spring of 1954, Endothal at 25 lb, IPC at 45 lb and CIPC at 45 lb gave the best results, reducing the wild oat count in June, 1955 by 58, 48 and 45% respectively. The 25 lb CIPC and 35 lb IPC treatments reduced the wild oats by 33 and 30% respectively. The other treatments gave from 0 to 25% control. There was some damage to the wheat and oat crops from the high rates of Endothal, CIPC, Dalapon and TCA treatments. Chemicals applied in the fall of 1954 gave the best wild oat control. The following treatments gave reductions in wild oats of 90% or more: 50 lb 2,4-D, 35 lb IPC, 45 lb CIPC, and 20 lb Endothal. Treatments which gave reductions of from 75 to 90% were 35 lb CIPC, 45 lb IPC, 15 lb Endothal, 25 lb CIPC, 25 lb Endothal, 25 lb 2,4-D, 25 lb IPC and 20 lb TCA. The remaining treatments, which gave from 40 to 70% control, were 15 lb CIPC, 10 lb Endothal, 15 lb IPC, 10 lb Dalapon and 20 lb Dalapon. The check plots averaged 54.7 wild oat plants per sq yd. The 25, 35 and 45 lb rates of CIPC applied in the fall of 1954 destroyed all the 1955 crops by 50, 95 and 100% respectively. TCA severely damaged wheat, oats, and barley, but only moderately damaged flax. Dalapon cuased severe to moderate damage to the cereals, but not to flax. Damage from other treatments was insignificant. (Contributed by the Experimental Farm, Regina, Sask.).

Cultural methods for wild oat control. Molberg, E. S. and Leggett, H. W. Wheat and barley were sown at heavy and light rates, with and without fertilizer, at two dates on land with a natural infestation of wild oats during the past 3 years. In 1953, Thatcher wheat and Vantage barley were used; in 1954 and 1955 the varieties were Selkirk and Olli. The wheat was sown at $2\frac{1}{2}$ and $1\frac{1}{4}$ bu/A and the barley at 3 and $1\frac{1}{2}$ bu/A. The fertilizer used was 50 lb 11-48-0/A. In 1953 and 1954 the late seeding was 5 weeks after the early seeding, and in 1955 the delay was 2 weeks. Results: The 3-year average reduction in wild oats from delayed seeding was 81.2% for wheat and 35.7% for barley. The average reduction from heavy seeding was 11.9% for wheat and 10.8% for barley. The fertilized wheat contained 28.0% less wild oats than the unfertilized, but the fertilized barley had 15.5% more wild oats than the unfertilized. Sowing barley instead of wheat reduced the wild oats by 42.1%. (Contributed by the Experimental Farm, Regina, Sask.).

A comparison of mechanical and chemical methods of maintaining summerfallow land. Phillips, W. M. Cultivation was compared with 2,4-D and combinations of 2,4-D and Dalapon as a means of weed control on land being summerfallowed. Spring growth of volunteer grain and early emerging weeds were satisfactorily controlled by cultivation or with an application of 1/2 lb/A of 2,4-D and 5 lb/A of Dalapon. A pre-emergence application of 4 lb 2,4-D/A following the first cultivation gave excellent control of all vegetation except green foxtail. One spring cultivation and a summer application of 1/2 lb/A 2,4-D, ester, gave control of the susceptible broad-leaved weeds but no grass control. When 5 lb of Dalapon were added, excellent control of foxtail and witchgrass (*Panicum capillare*) resulted. Stinkgrass (*Eragrostis cilianensis*) growth was greatly surpressed but nearly all of the plants remained alive. Soil moisture samples were taken prior to starting the experiment and additional moisture samples will be taken in the fall of 1955. Wheat was planted on all plots and wheat yields will be obtained in 1956. The 1955 growing season was extremely dry and only three cultivations were necessary to maintain the mechanically fallowed plots in a weed free condition. (Contribution from Field Crops Research Branch, ARS, USDA, and Fort Hays Branch, Kansas Agri. Exp. Sta.). Approved for publication.

Effect of light and 2,4-D on germination of pigweed seeds. Rojas-G., M. and Kommedahl, T. Seeds of pigweed (Amaranthus retroflexus L.) were collected in May from the previous year's plants and germinated on filter paper in Petri plates at room temperature. Seeds were germinated in continuous light, continuous darkness, and under normal day and night conditions. Seeds were soaked for 1 minute in concentrated sulfuric acid. 2,4-D amine at 5, 25, 50, and 500 ppm (acid equivalent) for 1, 5, 20, and 30 hours was applied to seed in the germination tests. Results: Continuous light reduced germination from 35 to 16% in non-acid treated seeds and from 48 to 30% in acid-treated ones. Acid-treated seeds increased in percentage germination when immersed for 1 hour in 2,4-D at 5, 25, and 50 ppm; however, when seeds were immersed in 500 ppm for 1 hour, the increased germination percentage was accompanied by a delay in radicle development. All other treatments arrested germination. Percentage germination in non-acid treated seeds was increased by immersing seed in high concentrations of 2,4-D for a short time, or by immersing in low concentrations for a longer time. (Dept. of Plant Pathology and Botany, Univ. of Minnesota, St. Paul, Minn. Paper No. 3440 Sci. Journ Series, Minn. Agri. Exp. Sta.).

Control of downy bromegrass (Bromus tectorum) with fall applications of herbicides. Sand, P. F. and Keyser, H. R. Duplicate 10' x 16½' plots of downy bromegrass were treated October 29, 1954 with Dalapon (sodium salt of 2,2-dichloropropionic acid) at 1, 2, 3, and 4 lb/A; CMU at 3 and 5 lb/A; Karmex FW (3-phenyl 1, 1-dimethyl urea) at 3 and 5 lb/A; Karmex DW [3-(3,4-dichlorophenyl)-1, 1-dimethyl urea] at 3 and 5 lb/A; sodium TCA at 7½, 10, and 12½ lb/A; sodium chlorate at 320 lb/A; Polybor-Chlorate at 320 lb/A; Amizol (3-amino-1,2,4-triazole) at 8 and 10 lb/A; sodium TCA at 3 lb/A plus 3 pints/A of DNBP; and sodium TCA at 5 lb/A plus 2 pints/A of DNBP. The downy bromegrass was 2-3" tall at the time of treatment. All the chemicals were applied in water at the rate of 40 gal/A with the exception of sodium chlorate which was applied dry and Polybor-Chlorate which was applied in water at the rate of 160 gal/A. Percent control was estimated June 6, 1955. Results: Dalapon at 1, 2, 3, and 4 lb/A gave 13, 75, 95, and 99% control respectively; CMU at 3 and 5 lb/A gave 40 and 48% control; Karmex DW at 3 and 5 lb/A gave 10 and 20% control; Karmex FW at 3 and 5 lb/A gave 68 and 98% control; sodium TCA at 7½, 10, and 12½ lb/A gave 98, 100, and 100% control; sodium TCA at 3 lb/A plus 3 pints/A of DNBP gave 90% control; sodium TCA at 5 lb/A plus 2 pints/A of DNBP gave 98% control. Amizol at 8 and 10 lb/A and sodium chlorate at 320 lb/A both gave 100% control. Polybor-Chlorate at 320 lb/A gave 98% control. (Contribution of Department of Agronomy, College of Agriculture, Lincoln, Nebr.; Nebr. Dept. of Agri. and Inspection, Division of Noxious Weeds, Lincoln, Nebr.; Univ. of Nebr. Expt. Sta., North Platte, Nebr.).

Control of downy brome, and volunteer wheat in a chemical fallow program. Shafer, N. E. Six 2 acre plots were treated by airplane at Sidney, Nebraska. Initial treatments were applied April 22 when the downy brome had 6 to 10 tillers and ranged from 3 to 6 in. in height. Volunteer wheat was tillering and averaged about 4 in. in height. Both surface and subsoil moisture were deficient at the time of treatment and remained deficient until May 16. Freezing temperatures occurred May 3rd and near freezing May 4, 5, 11, 12 and 13. Treatments and results were as follows when observed May 24:

	Percent kill	
	Downy brome	volunteer wheat
1. 4 lb Dalapon in 5 gal water/A	50	10
2. 2 lb Dalapon + 1 lb Amizol in 5 gal water/A	85	50
3. 2 lb Amizol in 5 gal water/A	95	95
4. 4 lb Dalapon + 1/2 lb Amizol in 5 gal water/A	90	85
5. 4 lb Dalapon + 1 lb Amizol in 5 gal water/A	95	95
6. 4 lb Dalapon in 2 gal water/A	15	no effect

In this test, Amizol appeared more effective than Dalapon at the rates used. It was distinctly more effective in eliminating volunteer wheat. Volume of spray solution used appears very critical as indicated by treatment no. 6. (Contribution from Agronomy Department, University of Nebraska, Lincoln, Nebraska). Approved for publication.

Preseeding application of herbicides for control of wild oats and green foxtail in several crops. Sexsmith, J. J. On June 1, 1955, seed of wild oats and green foxtail were broadcast and disked into a silty clay loam. On the same date and area the following chemicals were applied to duplicate plots and immediately disked-in to a depth of 3-4 in.: IPC, CIPC, isopropyl N-(3-methylphenyl) carbamate (5518), (1-chloropropyl-2) N-(3-methylphenyl) carbamate (5522), 2-chloroethyl N-(3-methylphenyl) carbamate (5523), and dichloral urea (DCU), all at rates of 4 and 8 lb active ingred/A. DCU was applied in water at approx. 190 gal/A, all others in water at 22 gal/A. Eight ft rows of the following crops were seeded in each plot on June 3: potato, cucumber, carrot, table and sugar beet, peas, green and dry bean, yellow mustard, flax, barley, wheat, and corn. Control estimates and notes on crop condition were taken between Aug. 1 and 5. Results: Wild oat control for the 4 and 8 lb rates respectively were: IPC 75-80% and 90-95%, CIPC 55-60% and 75%, 5518 75-80% and 80-90%, 5522 less than 70% and 60%, 5523 less than 75% and 65%, DCU 20% and 30-40%. Green foxtail control was rated as nil to poor for all chemicals excepting DCU which gave good control at 4 lb and excellent control at 8 lb. Wheat and barley were affected by all chemicals, least by DCU, badly thinned by 5522 and 5523, and completely eliminated by the 8 lb rate of IPC, CIPC, and 5518. Flax was badly thinned by 5518, slightly thinned by 8 lb IPC and 4 and 8 lb CIPC, but was not injured by the other chemicals. Peas and beans were injured by DCU. All other crops were unaffected by the treatments. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta). Approved for publication.

Pre-emergence application of herbicides for control of wild oats, green foxtail, and redroot pigweed in several crops. Sexsmith, J. J. On June 1, 1955, seed of wild oats and green foxtail were broadcast and disked into a silty clay loam plot area. Eight ft rows of the following crops were seeded in each of duplicate plots on June 3: potato, cucumber, carrot, table and sugar beet, peas, green and dry beans, yellow mustard, flax, barley, wheat, and corn. The following chemicals were applied to soil surface on June 7: sodium polychlorobenzoates (X-33-S and X-42-S) at ½ and 2 lb/A, CMU and 3-phenyl-1, 1-dimethyl urea (PDU) at ½ and 1½ lb/A, aminotriazole (AT) at 6 and 12 lb/A, a-chloro-N, N-diallylacetamide (AA) and a-chloro-N, N-diethylacetamide (EA) at 2 and 4 lb/A, and 2 chloroallyl diethyldithiocarbamate (EC) at 3 and 6 lb/A, all rates as active ingredient. Control estimates and notes on crop condition were taken Aug. 5-8. Results: (Considering only higher rate for each chemical). None of the chemicals gave any control of wild oats. No control of green foxtail was obtained with X-33-S or EC; poor control with X-42-S and AA; poor-fair control with CMU, PDU and AT; and fair-good control with EA. Control of redroot pigweed was poor-fair for X-33-S, X-42-S, and AT; all other chemicals gave no control. Carrots, peas, mustard, barley, wheat, and corn were not injured by X-33-S or X-42-S,

whereas severe injury resulted to all other crops from these benzoates. CMU and PDU caused slight injury to the legume crops but did not damage any of the other crops. AT caused moderate injury to potatoes and peas, severe injury to mustard and flax, causing no injury to other crops. For all practical purposes AA, EA, and EC caused no injury to any of the 13 crop plants. Due to relatively dry conditions existing for three weeks after application, it is suspected that the chemicals remained at or near soil surface for an extended period. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta). Approved for publication.

Effects of early and late applications of 2,4-D and MCP on Russian thistle in flax. Sexsmith, J. J. Russian thistle infested Redwood flax was treated at two growth stages with 2,4-D, amine; MCP, amine; and MCP, ester, at 0, 3, 6 and 12 oz/A, and 2,4-D, ester, and 2,4-D, low volatile ester, at 0, 2, 3, and 6 oz/A in water at 12.3 gal/A. Early treatments were applied on June 20 (31 days after seeding) when the flax was 2-4 in. tall with 10-20 leaves and Russian thistle in the seedling and "pine-leaf" to first branching stage from $1\frac{1}{2}$ to $2\frac{1}{4}$ in. tall. Late treatments were applied on July 13 (54 days after seeding) when flax was 15-18 in. tall in bud to first bloom and thistles 3-$7\frac{1}{2}$ in. tall with up to 10 branches. The naturally occurring non-uniform infestation of Russian thistle was classed as light to medium light, and therefore the harvest time control ratings indicated only the degree of curl-down and gave no indication of kill that may have resulted from some of the early treatments. Height measurements were taken at harvest for both weed and crop. Yield data are not yet available. Results: Judged from control ratings and height measurements, curl-down effect on Russian thistle increased with application rate and was much greater from the late date of treatment. At equal rates, the esters of 2,4-D were essentially equal, closely followed by 2,4-D, amine; MCP, amine and ester, gave equal results but were much inferior to the other chemicals. None of the chemicals at either date reduced flax height significantly, but much greater damage to bolls was noted as resulting from late treatments. Late treatment caused more maturity delay than did early treatments, and at both dates delays from MCP treatments were less than the other chemicals at equal rates. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta). Approved for publication.

Fall application of herbicides for the control of wild oats. Sexsmith, J.J. Chemicals were applied on October 13, 1954, on duplicate 16 x 30 ft plots, to fallow and stubble strips on shallow black loam which was heavily infested with wild oats at Stavely, Alberta. Treatments included IPC, CIPC, and Endothal at 5 and 15 lb/A in water at 23 gal/A and CMU at $2\frac{1}{2}$ and 5 lb/A in water at approx. 160 gal/A. Immediately after application the plot area was disked to a depth of 3-4 in. During 1955 the cropping was alternated such that spring wheat was seeded (June 8) on the '54 fallow strip and the '54 stubble was fallowed. Results: On fallow, the incidence of wild oat seedlings after first fallow operation was relatively unaffected by both rates of IPC and the 5 lb rate of CIPC and Endothal, but was reduced 70% by 15 lb Endothal and $2\frac{1}{2}$ lb CMU, reduced 90% by 15 lb CIPC, and reduced 95%+ by 5 lb CMU. In cropped plots, the wild oat stand (based on harvest time culm counts per 6 sq yd) was reduced 25%+ by $2\frac{1}{2}$ lb CMU, 50% by 15 lb Endothal, 60%+ by 15 lb CIPC, and almost 100% by 5 lb CMU. Wheat yield was relatively unaffected by both rates of IPC and the 5 lb rate of CIPC and Endothal, but was reduced approx. 25% by $2\frac{1}{2}$ lb CMU, 50% by 15 lb CIPC and Endothal, and 100% by 5 lb CMU. Both rates of CMU gave complete control of broad-leaved annual weeds. Under conditions of test, the yield of late seeded spring wheat was drastically reduced by all fall applications giving any useful degree of wild oat control. (Canada Dept. of Agri., Experimental Farm, Lethbridge, Alberta). Approved for publication.

Delayed seeding of wheat and barley for the control of wild oats. Sexsmith, J. J. To test the benefit of delayed seeding of spring grains for wild oat control, a test was set up in 1953 and continued in 1954 and 1955 at Lethbridge on dry land which had been continuously cropped for the preceding 14 years. Duplicate 618 ft x drill width plots were used for both wheat (var. Rescue 1953, var. Chinook 1954 and '55) seeded at 1 and 2 bu/A, and barley (var. Olli) seeded at 1¼ and 2½ bu/A, seeded with and without fertilizer (11-48-0) at 50 lb/A. Early seedlings, made at the normal date following the usual seedbed preparation (May 20/53; 10/54; 30/55), were compared with delayed seeding (June 16/53; 18/54; 15/55). Delayed seeding areas were worked once or twice, as demanded by conditions and growth, to kill wild oat seedlings. Yield samples and wild oat culm counts were obtained from 10 sq yd on each plot in each season. Results: The results for the three years of test are summarized in the following table.

Seeding Date	Seeding Rate	Fertilizer (11-48-0)	Spring Wheat Grain Yield	Spring Wheat Wild oat culms	Barley Grain Yield	Barley Wild oat culms
		lb/A	bu/A	no./sq yd	bu/A	no./sq yd
Early	Normal	0	17.9	35.9	24.8	19.0
		50	20.0	40.1	32.4	18.2
	Double	0	19.2	36.5	32.8	15.3
		50	22.6	9.1	30.0	7.0
		Avge	19.9	30.4	30.0	14.9
Late	Normal	0	14.9	0.8	21.8	0.9
		50	14.3	0.6	26.4	1.1
	Double	0	16.8	0.3	25.8	0.3
		50	16.0	0.3	26.9	0.3
		Avge	15.5	0.5	25.2	0.6

Wild oat stand was reduced markedly by delayed seeding of both crops. The results indicate no difference between seeding rates and use of fertilizer when seeding was delayed, but there is an apparent reduction of wild oats in both crops for the heavy seeding rate with fertilizer at the early date of seeding. This reduction is thought to be the result of plot location in relation to original infestation as much as to the treatment. As was to be expected, delayed seeding caused a reduction in the yield of both crops. The results indicate that in order to obtain the advantage of delayed seeding for wild oat control consistent with highest possible crop yield, spring wheat should be seeded at heavier than normal rate, and barley seeded at a heavy rate or fertilized when seeded at the normal rate. An early maturing barley would be preferable to spring wheat for use in the control of wild oats by delayed seeding as it would be more likely to escape early fall frosts and could be harvested early enough to prevent shattering of some wild oat seeds. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta). Approved for publication.

The effect of several urea herbicides on weeds when applied as post-emergence sprays. Slife, F. W. and Williams, M. C. An area infested with annual grasses was treated at 3 different times with liquid 3-(3,4-dichlorophenyl)-1, 1-dimethyl urea (DL), 3-(p-chlorophenyl)-1,1-dimethyl urea (CMU), and CMU + 2,4-D. Rates used were 1/2, 3/4 and 1 lb of acid of DL and CMU and 1/2, 3/4 and 1 lb of acid of CMU + 1/2 lb of 2,4-D at each rate. These materials were applied in 18 gal of water per acre when the grass had 1 to 2 leaves, 2 to 4 leaves, and 4 to 6 leaves. Grass weeds present were crab grass, yellow foxtail, green foxtail, cultivated millet, love grass (*Eragrostis cilianensis*), and some giant foxtail.

DL controlled all species at the 1 lb rate at all 3 dates of treatment except love grass at the last treatment date. DL at 3/4 lb controlled all species at the 1st two treatment dates but did not control the love grass at the last treatment date. DL at 1/2 lb controlled all species at the 1st treatment date but was less effective at the last treatment date. CMU at 1 lb controlled all species at all dates except love grass at the last treatment date. At 3/4 lb CMU gave good control at the 1st treatment date only and at 1/2 lb gave only partial control at the 1st treatment date. Adding 2,4-D at 1/2 lb to CMU gave results comparable to the DL material. (Contribution of the Department of Agronomy, Illinois Agricultural Experiment Station). Does not require approval of Station Director.

Control of annual weeds on two soil types with CDAA. Warren, G. F. CDAA (alpha-chloro-N, N-diallylacetamide) was used as a pre-emergence spray in three replicated experiments on muck soil and in three others on a fine sandy soil. Weed counts were made from three to six weeks after spraying. On much, 6 lb/A of CDAA gave excellent kill of a mixture of annual grasses in all cases. Control of purslane (Portulaca oreracea) varied from good to poor and of pigweed (Amaranthus retroflexus) and lambsquarters (Chenopodium album) from fair to poor. Smartweed (Polygonum spp.) and ragweed (Ambrosia artemisiifolia) were not controlled in any of the tests. On sandy soil the principal weed present was crabgrass (Digitaria sanguinalis) and CDAA failed to give control of this species at rates of 4 to 6 lb/A in any of the three experiments. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Ind.).

Control of annual weeds on muck soil with TCB. Warren, G. F. TCB (sodium salt of 2,3,6 trichlorobenzoic acid) was used as a pre-emergence spray in several replicated experiments on muck soil. Weed counts were made from four to six weeks after spraying. Good control of the following weeds was obtained at a rate of 1 lb or less per acre: pigweed (Amaranthus retroflexus), purslane (Portulaca oleracea), lambsquarters (Chenopodium album), ragweed (Ambrosia artemisiifolia), smartweed (Polygonum spp.) and wild lettuce (Lactuca spp.). Annual grasses, on the other hand, were not controlled by applications of 2 lb/A. A mixture of 2 lb of TCB and 6 lb of CDAA (alpha-chloro-N, N-diallylacetimide) was tried in one experiment with excellent results. This combination gave practically 100% control of all weeds present which included purslane, pigweed, smartweed and annual grasses. It is probable that the amount of TCB in this mixture could be reduced without greatly reducing its effectiveness. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Ind.).

Preseeding application of IPC to control wild oats in field peas. Wood, H. E., Fox, W. B. and Forbes, J. C. Following several years of trial plot work along similar lines, three farmers in the Portage la Prairie district cooperated by applying by boom sprayer, 6 lb liquid IPC in 5 imperial gal water, to one acre of land known to be infested with wild oats. The soil was clay loam. Immediately after application and before planting to field peas the IPC was incorporated into the soil by light disking. Because of a wet spring, application of chemical and planting was delayed until late May to early June. At the three locations very promising control, 95% or better, of wild oats was obtained, without any apparent damage to the peas. At one location, in addition to the wild oats, a heavy infestation of barnyard-grass (Echinochloa crusgalli) was much reduced in stand. (Contribution from the Weeds Commission, Manitoba Department of Agriculture, Winnipeg, Canada). Approved for publication.

Pre-emergence application of carbamate compounds to control wild oats in cereal crops. Wood, H. E., Howden, J. and Forbes, J. C. At four locations -- three in the Portage la Prairie district and one near Oak Bank -- sq rod plots, known to be heavily infested with wild oats were preseeding treated with chemicals of the dithio-carbamate group. Three Monsanto coded products were applied by knapsack sprayer, using 80 imperial gal water/A, as follows: 553-T, 2, 4 and 8 lb/A; 551-E and 552-I, 1½, 3 and 6 lb. Immediately before application one series of plots was planted to wheat, two to barley, the other left unseeded. The chemical solution was applied to the surface of the soil, without tillage thereafter. Application was made at three locations May 20, temperature 85°F., the soil moist, an inch of rain falling two days later; the Oak Bank series was treated June 1, temperature 65°F., soil moist, a light rain followed immediately after application. On not a single plot was any visible effect apparent to either the wild oats that later grew or to the grain crop or other vegetation. (Contribution from the Weed Commission, Manitoba Department of Agriculture, Winnipeg, Canada). Approved for publication.

SPRING SOWN GRAIN

Summary

W. J. Breakey

Thirteen abstracts were received for inclusion in this Summary, while nineteen other abstracts received will be reported under their proper headings. Four abstracts dealt with the treatment and control of wild buckwheat (polygonum convolvulus) in wheat.

Wheat

In general LV4 at rates of 3, 5 and 8 ozs./A gave reasonably good control of wild buckwheat. Treatments applied at weekly intervals proved more effective. One ounce acid equivalent of Amizol added to the LV4 appeared to improve effectiveness and severely stunted the weed with no significant difference between yields of wheat. Application of 2,4-D ester at 4 ozs./A applied to wheat at the three leaf stage caused spike deformity and sterility in wheat, while MCP applied at the same date and rate caused no visible damage.

Oats

Oats treated with MCP and 2,4-D ester at 8 ozs./A at 25 different periods of growth at intervals of 2 days showed no significant difference in yields for the MCP treatment, while the difference in yields of oats treated with 2,4-D ester were highly significant. MCP formulations at 8 ozs./A proved more effective than 2,4-D in the control of hemp nettle in oats. The yield of oats on the MCP treated areas out-yielded 2,4-D amine and LV4 ester treated plots by a wide margin. When toadflax in oats was treated with Amizol at different rates of 3, 6 and 16 pounds/A. The 3 lb. rate caused only observable depression in height and yield, while at the six lb. rate damage to the oats was more severe. At the 16 lb. rate yield was reduced by over 75%.

Barley

When barley was treated with 2,4-D ester and MCP ester at 4 ozs./A at 5 growth stages. 2,4-D depressed barley yields when applied at late shot blade stage. In weedy plots treatments with 2,4-D at 4, 5, 7 and 8 leaf stages resulted in substantial increase in yield. Treatments with MCP reculted in increased yields at all stages except the late-shot blade stage.

Cultural

Pre-emergence (Rod weed Harrow) appeared to have a stimulating effect on green foxtail in wheat, while post-emergence treatment provided some measure of control. Delayed seeding provided an effective control, but in some years the latter practice might prove hazardous especially in light soil areas. A two year rotation of fallow and grain proved highly practical for the control of toadflax in barley. The alternate fallow and grain rotation reduced the toadflax stand by 96.8 percent.

Effect of pre-emergence sprays on wild buckwheat. Forsberg, D. E. In the spring of 1955 a four replicated test was layed out in which plots were sprayed on May 21 prior to the seeding of barley on June 15th. The following chemicals were used; Amizol at 2, 6, 12, 16 lbs. acid equivalent/A., Amizol and 2,4-DE at 2 oz. and 6 lbs., 2 oz. and 12 lbs., 4 oz. and 6 lbs., 4 oz. and 12 lbs., 6 oz. and 6 lbs., 6 oz. and 12 lbs., acid equivalent/A respectively. Also Amizol and LV-4 of 2 oz. and 6 lbs., 2 oz. and 12 lbs., 4 oz. and 6 lbs., 4 oz. and 12 lbs., 6 oz. and 6 lbs., and 6 oz. and 12 lbs., of acid equivalent/A respectively. Sevtox, Denocate and Dow pre-emergence was used at 4, 6 and 8 lbs./A. RESULTS: During the summer all plots, with the exception of those receiving straight Amizol, Sevtox, Denocate, and Dow pre-emergence, gave 100% control of all weeds. These plots did not have any effect on the germination and emergence of the barley. However, as the barley reached the shot blade severe onion leaf effect on plots receiving the heavier rates of combined chemicals. Aphid damage to the barley was so severe that yield records could not be taken. From this test it would appear that the rates used could be reduced considerably and still receive good weed control. (Contributed by Experimental Farm, Scott, Sask.)

The reaction of barley at five stages of growth to the removal of wild mustard (Sinapsis arvensis) with 2,4-D and MCP. Friesen, George. U.M. 570 barley was seeded on May 6 on weed free and weedy plots. 100 mustard plants per sq. yd. were established on the weedy plots. At 5 stages of growth the barley was treated with 2,4-D ester and MCP ester at 4 oz. acid equivalent per acre. The 5 stages were: early 3-leaf, 4-leaf, late 5-leaf, 7-8 leaf, and late shot-blade. At the first spraying date a considerable number of deformed heads, some sterility and lower yields resulted in the 2,4-D treated plots. No damage was visible in the MCP treated plots. 2,4-D also depressed yields significantly when applied at the late shot-blade stage. In the weedy plots treatment with 2,4-D at the 4-leaf, late 5-leaf, and 7 to 8-leaf stages resulted in substantial increases in yield. Treatment with MCP resulted in increased yields at all stages except the late shot-blade stage. At this last spraying date the competition effects of the mustard had reached the point where no benefit was derived from removing the weed. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg, Canada.)

The reaction of oats at five growth stages to the removal of wild mustard with MCP and 2,4-D. Friesen, George. On May 10, Rodney oats was seeded on weed-free and weedy plots. On the weedy plots wild mustard had previously been seeded so as to obtain 100 plants per sq. yd. The 5 stages at which the two herbicides 2,4-D and MCP were applied are as follows: early 2-leaf, 3-leaf, 4-leaf, 6-leaf and early shot-blade. Both herbicides were applied at the rate of 4 oz. acid equivalent per acre and ester formulations were used in both cases. 2,4-D caused considerable damage to oats at all growth stages with the exception of the shot-blade stage. Damage was most severe at the 4-leaf stage with over a 50% reduction in yield as compared to the weed free check plot and a 33% reduction in yield compared to the weedy check plot. At the other stages mentioned damage was also severe but yields did not drop below those of the untreated weedy plot. In contrast to 2,4-D, the herbicide MCP caused no apparent damage to oats except at the 4-leaf stage, but even here the damage was comparatively light. It was also of interest that 100 mustard plants per sq. yd. reduced the yield of oats by 14 bushels per acre in this experiment. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg Canada.)

2,4-D vs MCP for the control of annual weeds in oats. Friesen, H. A. and D. R. Walker. The butyl ester, amine and sodium salt formulations of MCP, the butyl ester and alkanolamine of 2,4-D and a low volatile propylene glycol ether ester (Dows 1010) each at 4 and 8 oz/A were sprayed on annual weeds in Eagle oats at two growth stages. At the first date of spraying the weeds were in the advanced seedling stage and the oats had 3 to 4 leaves and average height of 6 inches. At the second date, the stinkweed was in the rapidly growing stage just prior to budding, while the oats were well tillered but the flag leaf had not yet emerged. The weed population showed much variation between but not within replicates. On three of the six replicates hemp nettle Galeopsis tetrahit, was by far the most prevalent, the average stand being 400 plants/sq. yd. Stinkweed, Thalspi arvense was present on all plots to the extent of some 50 plants/sq. yd., while other species such as ball mustard, Neslia, lambs quarters, Chenopodium and Russian pigweed, Axyris, averaged 75 plants/ sq. yd. on all plots. Results: Plant counts and dry weight of weeds at flowering time showed that each of the treatments resulted in kills of Thalspi, Neslia, Chenopodium and Axyris at each of two spraying dates. Galeopsis proved highly tolerant to each treatment of 2,4-D amine, butyl ester or low volatile ester. The MCP formulations at 8 oz/A, at the first date of spraying, killed some 25 percent of the Galeopsis plants and stunted the remainder to the extent that dry weight of the weeds produced was less than 50 percent of the untreated check. With the exception of MCP ester, none of MCP formulations at 4 oz/A resulted in an appreciable reduction in the dry weight of Galeopsis produced. At the second date of spraying the MCP formulations were somewhat less effective on Galeopsis. The suppression of the Galeopsis, Thlaspi and other species by the MCP formulations at 8 oz/A was reflected in the higher yields of oats following those treatments at each date of spraying. The 2,4-D amine, ester and low volatile ester due to their failure to suppress the Galeopsis and their adverse effect on the oat crop depressed the yield seriously at each spraying date, particularly so at date 2. It was of particular interest to note that on the 3 replicates in which Galeopsis was not prevalent and the weed control following each treatment was nearly complete the MCP treated plots outyielded 2,4-D ester, amine and low volatile ester treated plots by a wide margin.

This same project was conducted in 1954. The reaction of the weed species to the various formulations followed a closely similar trend to that of 1955. The infestation of Galeopsis in 1954 was considerably lighter and the degree of suppression obtained with MCP formulations appeared greater - which was reflected in highly significant yield increases. In 1955, the Galeopsis was so dense on three of the replicates that growth of weed was considerably stunted on both the treated and untreated plots. This would largely account for the somewhat less striking results obtained from the use of MCP this year. (Contributed by the Experimental Farm, Lacombe, Alta.)

	Dry weight of Weeds in Pounds/Acre				Yield of Oats in Bushels Per Acre		
Treatment	Galeopsis	Thlospi	Others	Total	Rep. 1-3	Rep. 4-6	Average 6 Reps.
MCP 4 oz/A	676	0	164	840	37.6	80.6	59.0
MCP 8 oz/A	425	0	132	557	54.7	72.4	64.6
2,4-D 4 oz/A	785	0	132	917	30.7	60.0	45.4
2,4-D 8 oz/A	933	0	48	981	26.1	57.0	41.1
Check	800	720	760	2280	48.7	79.0	63.8

Response of Toad flax to treatments of Amizol in oat crop. 1954-5. Pavlychenko, T. K. In a dense infestation (14 to 219 plants, sq. yd.) of toad flax (Linaria Volgaris), seeded to oat crop, four series of treatments were made at 3, 6 and 16 lbs./A Amizol (3-amino-1,2,4-triazole) at advance rosette, bud and "mowed at bud" stages as follows: T - treated once; TC - treated and cultivated, when regrowth in plots treated at "bud" began to appear; TR - treated and retreated when regrowth was in evidence over the cultivated areas, and TCR - treated and cultivated as in TC and treated and retreated as in TR. Permanent, replicated quadrats were established in all plots and records taken periodically in 1954 and in 1955. The amount of regrowth was always expressed in terms of the initial population before the treatment. Moisture was abnormally high in the season of 1954 and about normal in 1955. RESULTS: Top growth was strongly etiolated and slowly killed in all series and at all rates and stages. Regrowth in "rosette" stage was from 4 to 43% at 3 lbs./A; 0 to 19% at 6 lbs./A; and 0 to 7% at 16 lbs./A. The results at 3 lbs./A rate were considered "unsatisfactory." Those at 6 and 16 lbs./A were highly satisfactory, especially in series TC, TR and TCR. At "bud" stage only 16 lbs./A rate was fully satisfactory with regrowth of 0 to 4%. The other two rates gave great reductions in stand in TC and TCR series, yet agronomically were not satisfactory. At "mowed at bud" stage all three rates and stages in all four series produced very abundant and healthy regrowth, in some cases much higher than the initial population. Unlike several other persistant perennials, toad flax seems to be much more susceptible at the rosette stage than at the "bud" stage. This project was carried out in 1954 in oat crop. The rates used were too high and all of them have caused depression to the crop in various degrees. At 3 lbs./A the crop showed only observable depression in height and yield. (up to 10%). At 6 lbs./A the effect on oats was very serious, not so much on height and stand, but the yield was reduced by 68%. At 16 lbs./A, again the height was further depressed and the yield was reduced by over 75%. (Contributed by Agricultural Division of American Chemical Paint Company, Saskatoon, Saskatchewan).

The effect of 2,4-D and MCP on oats. Waywell, C. G. Through the past three growing seasons a study of the effect of 2,4-D and MCP has been made on oats sown in replicated yield plots. In both 1954 and 1955 six replicates were used for each treatment. Beaver oats were sown on all plots in both years. The treatments used were MCP amine at 6, 8, and 12 oz./A; 2,4-D amine at 6, 8, and 12 oz./A; MCP butyl ester at 4, 6, 8, and 12 oz./A; and 2,4-D butyl ester at 4, 6, 8, and 12 oz./A. The 8 ounce rate of both MCP and 2,4-D butyl ester was applied at 25 periods of growth starting with a first treatment one day after emergence and thereafter at two day intervals, weather permitting. All other treatments were applied during the early stages of growth.

The 1955 results agreed with those obtained in 1954. 2,4-D butyl ester had a depressing effect on yields compared with 2,4-D amine and with both types of MCP when applied during the early stages of growth. In the portion involving MCP and 2,4-D butyl ester at 8 oz./A with treatments applied at 25 periods an analysis of the data showed that the differences in yield for the MCP treatments were not significant while the differences for the 2,4-D treatments were highly significant. The first three weeks after emergence was the most critical period in both years. (Dept. of Botany, Ontario Agricultural College, Guelph, Ontario.)

Effect of herbicides on wild buckwheat. Forsberg, D. E. In 1955 ester of 2,4-D, and low volatile esters (LV-4 and 1010) were sprayed on wild buckwheat at 5, 8, and 12 oz. of acid equivalent/A. Also included in this test was Heyden 1281 at ½, 1,2 and 4 lbs. of acid equivalent/A. Dow spreader sticker was also used in combination with 5 and 8 oz. acid equivalent/A of 2,4-DE, LV-4, and 1010. Each of the above chemicals were sprayed on the buckwheat when in the 2nd true leaf stage and also when in the 4th leaf stage. The grain crop, which was Rescue wheat, was in the 3rd and 4th leaf stage. RESULTS: Heyden 1281 showed very little effect on the weed. However, the yields of wheat were reduced considerably, especially at the higher rates. LV-4 appeared to give the best control of the weed especially at the higher rates and in cases when the buckwheat was treated at the early stage the yields of grain were significantly higher than the check. 1010 did not give as good results on the buckwheat as LV-4 and in all cases the yield from these plots were not significantly above the check. 2,4-DE at the higher rates held the buckwheat down considerably and appeared equal to LV-4. The addition of spreader sticker to the 2,4-DE and LV-4 did enhance the control of these chemicals. In all cases the earlier date give the best control and the least effect on grain yields.

2,4-D ester and LV-4 at 3 oz. acid equivalent/A applied at 3 dates at weekly intervals and 2,4-D ester and LV-4 at 5 oz. acid equivalent/A at 2 dates applied at one week intervals were sprayed on buckwheat in the 2nd true leaf stage. RESULTS: All treatments appeared very striking on buckwheat with no significant difference between the yields of wheat on these treatments. In all plots the buckwheat was severely stunted with a little better results showing up with the LV-4 plots. As a result of an infestation of a beetle on the buckwheat conclusive results could not be obtained. (Contributed by the Experimental Farm, Scott, Sask.)

Effect of a combination of chemicals on wild buckwheat. Forsberg, D. E. In 1955 Rescue wheat was sprayed with combinations of LV-4 and amizol, and 2,4-DE and amizol, at two dates in a six replicated test in an attempt to control wild buckwheat. LV-4 at 5 oz. acid equivalent/A plus 1 oz. acid equivalent of amizol, LV-4 8 oz. acid equivalent/A plus 1 oz. acid equivalent/A, of amizol 2,4-DE at 5 oz. acid equivalent/A plus 1 oz. acid equivalent/A, of amizol and 2,4-DE 8 oz. acid equivalent/A plus 1 oz. acid equivalent/A of amizol were used. Plots were sprayed when the buckwheat was in the 2nd true leaf stage and 6th true leaf stage, with the grain in the 3rd and 5th leaf stage. RESULTS: The immediate results in date one were very striking in that the addition of the amizol seemed to give a more drastic effect on the buckwheat. Grain yields from all plots when sprayed at date one were significantly higher than the check. Due to the beetle which attacked the buckwheat an appraisal of date two could not be made. However, in all cases the grain yields from these plots were lower than the check but not significantly lower. (Contribution by the Experimental Farm, Scott, Sask.)

Comparison of LV4 and MCP in the control of wild buckwheat. Forsberg, D. E. In 1955 LV4 and MCP butyl ester in a six replicated test, were sprayed on wild buckwheat, in Rescue wheat, at 5, 8, 12 and 16 oz. of acid equivalent/A, and also at two 5 oz. applications sprayed one week apart. The buckwheat was sprayed in the 2nd and 3rd true leaf stage and when the grain was in the 3rd leaf stage. RESULTS: Due to a heavy infestation of *Gastrophysa polygoni* L. the final buckwheat counts were impossible to take. However, general notes on the area indicated that the LV4 at 8, 12, and 16 oz. stunted and retarded the growth of buckwheat while the two 5 oz. applications held the buckwheat pretty well in check. The MCP at all rates were not as effective as the LV4. Analysis of grain yields showed no significant difference between treatments. General trend in yields were lower yields at the heavier rates and the double applications. (Contribution by the Experimental Farm, Scott, Sask.)

Effect of herbicides on wild buckwheat (Polygonum convolvulus). Keys, C. H. A buckwheat infested area at Loverna Sask. was sown to wheat and then divided into sixty plots 1/264 of an acre in size. All treatments were randomized and replicated four times. 2,4-D, butyl ester, single application was put on at 6, 8, 12 and 16 oz/A acid equivalent; duplicate applications with a two week interval between were 2,4-D butyl ester at 4, 6, 8, 12 and 16 oz/A acid equivalent. Amate was applied at 2 and 4 lb/A as well as combinations of 2,4-D butyl ester at 6 oz/A plus amazol (Amine triazole) at 2, 4, and 8 lb/A. The first spraying was done on June 20 when the wheat was 5 inches tall and the buckwheat ranged from the seedling to four leaf stage. The grain was in shot blade when the second application of the duplicate treatments were made. RESULTS: All growth on plots that received amizol was killed but later in the season there was some regrowth of buckwheat and other weeds. The plots receiving amate at the 2 and 4 lb/A rate exhibited a fair degree of control but not a complete kill. There was very little difference between rates of 2,4-D or number of applications but all 2,4-D treatments provided some measure of growth control. The amount of seed formed was very limited. There were no significant increases or decreases in yield due to treatments with the exception of the plots receiving amazol at the relatively high rates. Dry weather conditions during July, in all probability had an adverse effect on the growth of buckwheat. (Contribution from Experimental Farm, Scott, Sask.)

Post seeding tillage and dates of seeding for control of green foxtail (Setaria viridis). Keys, C. H. An area of wheat stubble uniformily infested with green foxtail was divided into 14 plots for the purpose of testing several post seeding tillage treatments, at two dates of seeding for control of this weed. The treatments, sown at the usual time, included pre-emergence rod weed, pre-emergence harrow; post-emergence harrow; pre-emergence rod weed plus post-emergence harrow and a plot not receiving any treatment. The plots sown one month later included a check plot and pre-emergence rod weed plus post-emergence harrow. All treatments were duplicated. Pre-seeding tillage in all cases consisted of ploughing, packing and seeding immediately with a press drill. At harvest time each plot was sampled for yield by the square yard method and green foxtail scores were taken at each sampling location.

Yields and Weed scores of Cultural Treatments

Treatment #	Seeding Time		Bu/Acre Grain yield	Weed Score % of check
1	Normal	Pre-emergence Rod weed	13.0	107.2
2	"	Pre-emergence Harrow	15.2	112.0
3	"	Post-emergence Harrow	20.2	59.8
4	"	Pre-emergence Rod weed - post-emergence Harrow	19.6	78.0
5	"	Check	15.4	100.0
6	Delayed	Check	22.4	58.8
7	"	Pre-emergence Rod weed - post emergence Harrow	19.6	91.9

Results indicated that the weed scores ranged inversly to yield of grain. Pre-emergence treatments appeared to have a stimulating effect on the weed while the post-emergence treatments provided some measure of control. Delayed seeding without further treatment provided as effective control as any studied but the practice would be hazardous in many years due to the rapid moisture loss in areas of light soil where this weed has been a particular problem. This being only one years results definite conclusions cannot be drawn. (Contribution from the Experimental Farm, Scott, Sask.)

The reaction of wheat at five growth stages to the removal of wild mustard with 2,4-D and MCP. Friesen, George. Selkirk wheat was seeded on May 5 with 0 and 100 mustard plants per square yard. MCP ester and 2,4-D ester, both at 4 oz. acid equivalent per acre, were applied at five stages of growth, namely: early 3-leaf, 4-leaf, late 5-leaf, early 7-leaf, and shot-blade stage. It was observed that 2,4-D caused some damage to the wheat at the earliest spraying date, i.e. early 3-leaf stage. Damage was expressed in spike deformities and sterility. When MCP was applied at this early date no apparent damage resulted. No visible damage occurred from later stage treatments. (Contribution from the Division of Plant Science, The University of Manitoba, Winnipeg, Canada.)

Cultural

Rotational practices for toadflax (Linaria vulgaris) control. Keys, C. H. & Forsberg, D. E. Rotation of alternate fallow and grain; fallow, grain, grain and fallow, fallow, grain have been under study since the project was revised in 1954. Previous studies indicated that the two year rotation of fallow and grain was the most practical for control purposes and the revised studies have supported this finding. Weed scores, taken after harvest in 1955 indicated that the alternate fallow and grain rotation had reduced the toadflax stand by some 96.8%. The system of two years fallow and crop reduced the toadflax stand by 98.4% but the further reduction in toadflax has not been worth the extra year of fallow. The inclusion of a second crop between fallow periods has resulted in an increase in the stands of toadflax. The weed scores taken after removal of the second crop, barley, indicated that the toadflax had increased to approximately 59% of a complete stand. This is also in agreement with earlier findings. (Contribution from Experimental Farm, Scott, Sask.)

WINTER WHEAT

Summary

L. E. Anderson

In the two studies described by the following abstracts it was found that fall applications of 2,4-D to winter wheat delayed maturity with all rates and at all stages of growth, but yield was not reduced by treatments at the 2-3 tiller stage. In a comparison of 2,4-D formulations it was found that the ester delayed maturity one day and reduced the yield one bushel per acre more than did the amine.

Abstracts

Effect of 2,4-D on irrigated Concho Wheat. Wiese, Allen F. and Rea, H. E. Two,4-D ester (propylene glycol butyl ether) was applied to Concho wheat at 0.5, 1.0, 2.0 and 1.0 (plus wetting agent) pounds per acre in the fall of 1954 while the crop had 2 leaves, 2 to 3 tillers and 6 to 8 tillers and in the spring at the full tiller, boot and flowering stages. In addition to 6.5 inches of natural rainfall, the wheat received pre-planting irrigation and 4 additional 4-inch irrigations. The experimental design was a split plot with 4 replications. The wheat was delayed by all rates of 2,4-D in the fall applications. Tillering, bushel weight and yield were reduced by all rates at the 2 leaf and 6 to 8 tiller stages. At the two leaf stage the yields for check, 0.5, 1.0, 2.0 and 1.0 (plus wetting agent) pounds per acre rates were 24.4, 15.8, 14.9, 7.8 and 16.4 bushels per acre, respectively. At the 6 to 8 tiller stage the yields for the same rates were 26.4, 17.7, 17.0, 13.5 and 17.8 bushels per acre, respectively. It is noteworthy that no damage to the wheat other than delay was caused at the 2 to 3 tiller stage. This difference between the 2 to 3 tiller and 6 to 8 tiller stages may have resulted from favorable growing conditions brought about by an irrigation applied between the two dates of treatment.

In another experiment 2,4-D ester (propylene glycol butyl ether) and 2,4-D amine (ethanol and isopropyl) were each applied to Concho wheat at 0.33, 0.66, 1.0 and 2.0 pounds per acre at the 2 to 3 leaf stage in the fall and during the full tiller stage in the spring. The experimental design was a split plot with 3 replications. Similar irrigation practices were used as described in the first experiment. On the average, the ester delayed the crop 1 day and reduced the yield 1 bushel per acre more than did the amine. Both chemicals caused similar reductions of bushel weight and tillering. (Contribution from the Amarillo Experiment Station, U.S.D.A. and Texas Agricultural Experiment Station Cooperating) Approved by T.A.E.S. T.A. 2269

SORGHUM

Summary L. E. Anderson

Abstracts submitted relative to the use of chemicals for weed control in sorghum included the results of studies with respect to dates of application, use of various growth regulators, combinations of 2,4-D with minor elements, pre-emergence applications, and chemical treatments under irrigation.

Severe yield reduction as a result of applications during the transition stage of growth confirms information reported previously.

Grain sorghum was found to be more tolerant of the 3,4-D and propionic compounds than of 2,4-D, but weed control was less effective.

The addition of minor element dusts to 2,4-D did not result in significant differences in yield nor did they reduce the hazard of applications made during the critical transition period.

Of the various formulations used as pre-emergents, 2, clorcallyldiethyldithiocarbamate (CDAA) controlled 84 to 87% of the weeds with no apparent injury to the sorghum.

Yield reductions were observed under irrigation where one pound of 2,4-D amine was applied at the 1-inch stage and by 0.5 and 1.0 pound rates applied during the transition period.

Abstracts

The effect of 1/2 pound 2,4-D ester applied on 30 dates on the yield of Midland milo. Phillips, W. M. In 1954 Midland milo was treated at thirty stages of development with 1/2 pound 2,4-D ester per acre. Four replications were used. The treatments were started when the sorghum had two leaves and was approximately 1. inch tall. Applications were continued at 2 to 3 day intervals throughout the season. The first four treatments, made prior to the time the sorghum was 3 inches tall, caused some lodging and some plants were killed, however, the data failed to show reduction in yield due to these early treatments. Applications made from the 3 inch stage to the 10 leaf stage (approximately 15 inches tall) caused little effect on the yield but did result in typical brace root malformation. At 15 inches the sorghum heads were beginning to develop in the growing point and for approximately 10 days yield reductions averaged nearly 50%. Applications of 2,4-D during the heading and blooming period did not, in most cases, seriously reduce yield. Determination of the average weight per 100 kernels gave indications that the reduction in yield was due to a smaller number of kernels rather than lighter weight kernels. The lower yielding plots had higher weight per 100 kernels than the no treatment areas. Test weight was not significantly affected by any of the treatments. Results of this experiment are similar to those reported in 1953. (Contribution from Field Crops Research Branch, ARS, USDA, and Ft. Hays Branch Agricultural Experiment Station, Hays, Kansas)

The effect of several growth regulating compounds on the yield of Midland milo. Phillips, W. M. An isopropyl ester and an amine of 2,4-D at 0, 1/8, 1/4, 1/2 and 1 pound per acre were applied in 1954 to Midland milo when the crop was 4 to 6 inches tall and in the early boot stage. In addition, at the time of the second application 3 low volatile esters of 2,4-D, an ester and amine of 2,4,5-

trichlorophenoxy, propionic acid, and 3,4-D ester were used at 0, 1/4, 1/2 and 1 pound per acre. As has been previously reported applications of 2,4-D made during the 4 to 6 inch stage of development caused little reduction in sorghum yields. The second treatment was made shortly after the sorghum growing point had changed from vegetative to floral. The applications of 2,4-D at this stage resulted in considerable yield reduction when the rates were 1/4 pound per acre or more. The average reduction for all of the 1/2 pounds rates exceeded 50%. Yields from plots treated with equal rates of 2,4-D ester and 2,4-D amine were similar, and in several instances the amine treated plots had lower yields. The low volatile esters of 2,4-D gave results similar to those obtained from the isopropyl formulation. The 3,4-D ester and the propionic compounds did not reduce sorghum yields as much as the 2,4-D formulations. However, these chemicals are not entirely satisfactory for controlling many of the annual weeds which often are found growing in the sorghum crop. (Contribution from Field Crops Research Branch, ARS, USDA, and Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas)

The effect of several 2,4-D and minor element dust formulations on the yield of Midland milo. Phillips, W. M. In 1954 dust formulations containing sulphur, manganese, copper, zinc, iron and boron together with 0, 1-1/4%, 2-1/2% and 6-1/4% 2,4-D were compared with a dust containing 6-1/4% 2,4-D with no minor elements and a 2,4-D ester spray application. These materials were applied at 5-1/2 and 11 pounds per acre when the sorghum was approximately 8 inches tall and at the early boot stage of crop development. The first stage normally is considered one of the safest from the standpoint of 2,4-D applications. At the time of the second treatment the crop is usually highly susceptible to 2,4-D treatment. The rates used are equal to approximately 1/3 and 2/3 pounds 2,4-D per acre of the 6-1/4% 2,4-D dust. The 2,4-D spray was applied at 1/3 and 2/3 pounds per acre. Applications at the first stage of crop development did not cause any significant change in the sorghum yields. Yields from plots treated in the early boot stage indicate that the addition of minor elements did not lessen the danger of crop yield reductions following treatment with 2,4-D. In no case did the minor elements appear to increase yields, whether used with 2,4-D or alone. Yield reductions caused by dusts containing 2,4-D were fully as great, and in several instances greater, than those resulting from 2,4-D spray applications. (Contribution from Field Crops Research Branch, ARS, USDA and Fort Hays Branch Agricultural Experiment Station, Hays, Kansas)

Pre-emergence weed control in sorghum. Sand, P. F. Midland milo was planted June 1, 1955 at Lincoln, Nebraska on Sharpsburg silty clay loam, a soil that has good surface and internal drainage. Plots were three rows wide, thirty-six feet long and replicated three times. The treatments applied were sodium salt of 2,3,6-trichlorobenzoic acid at 1/2, 1, 2, and 4 lb./A; 2-chloro-4,6-bis (diethylamino)-S-triazine at 2,4, 6, and 8 lb./A; a-chloro-N,N-diallylacetamide (CDAA), a-chloro-N,N-diethylacetamide (CDEA), and 2-chloroallyldiethyldithio-carbamate (CDEC) at 4 and 8 lb./A.; and DNBP amine salt at 8 lb./A. The chemicals were applied in fifty gallons of water per acre on June 4, 1955. The soil surface was dry at the time of application, however, there was sufficient moisture to germinate the seed. On June 4, the date of treatment, 1.34 inches of rain was received which leached the chemical into the soil and gave ideal conditions for injury to the germinating seedlings and also for weed control. Moisture conditions were excellent throughout the month of June.

Weeds infesting the plots included stinkgrass and pigweed. Notes were recorded on weed control July 2, 1955. The sodium salt of 2,3,6-trichlorobenzoic acid at 1/2, 1, 2, and 4 lb./A. gave 77, 93, 96, and 99 percent control of weeds and 0, 25, 45, and 98 percent kill of sorghum; 2-chloro-4,6-bis-(diethylamino)-S-triazine at

2, 4, 6, and 8 lb./A gave 0, 0, 60, and 57 percent kill of weeds and 0, 54, 60, and 73 percent kill of sorghum; CDAA at 4 and 8 lb./A. gave 84 and 87 percent kill of weeds with no injury to sorghum; CDEA and CDEC did not give satisfactory control of weeds and CDEC killed 90 percent of the sorghum at both rates; DNBP amine salt at 8 lb./A gave 87 percent control of weeds and killed 73 percent of the sorghum. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska)

Effect of 2,4-D on irrigated Redbine 60 sorghum. Wiese, Allen F. and Rea, H. E. In 1954, 2,4-D amine (ethanol and isopropyl series) was applied at 0.0, 0.25, 0.5 and 1.0 pounds per acre at 8 stages of sorghum growth. The growth stages were 1 inch, 3 inches, 6 inches, 10 inches, 15 inches, 25 inches, boot and flowering. The experimental design was a split plot with 3 replications. The crop received 10 inches of rainfall and three 4-inch irrigations during the growing season. The chemical treatments caused neither growth abnormalities nor had any effect on the stand or height of the sorghum. Yields were significantly reduced by the 1.0 pound rate at the 1-inch stage, and by the 0.5 and 1.0 pound rates at the flowering stage. The check yields averaged 2676 pounds per acre, and the greatest yield reduction, 400 pounds per acre, resulted when 1.0 pound per acre was applied at the flowering stage. (Contribution from the Amarillo Experiment Station, U.S.D.A. and Texas Agricultural Experiment Station Cooperating.) Approved by T.A.E.S. T.A. 2271

Corn

Summary

D. W. Staniforth

Interest in herbicides for the control of annual weeds in corn was greatly increased in 1955, judging from the number of abstracts received. Nine states contributed a total of eighteen abstracts, double the number received in 1954. These abstracts reported the results of experiments with established herbicides and with a number of new experimental materials. Although results obtained with some of the new materials were most promising, additional regional testing must precede any general recommendation of their use. As a result no changes were made in the recommendations for the use of herbicides for weed control in corn.

Several investigators reported the results of field evaluations of a-chloro-N, N-diallylacetamide (CDAA), a-chloro-N, N-diethylacetamide (CDEA) and 2-chloro-allyldiethyldithiocarbamate (CDEC). In general results showed CDAA slightly superior to CDEA and both greatly superior to CDEC when used at rates of 4 pounds per acre and up as pre-emergence sprays on corn. Injury to corn was very slight at rates of 4, 6, and 8 pounds per acre, and control of grass weeds excellent with CDAA and CDEA. Indications are that early post-emergence applications may be quite effective with no corn injury, but applications after3-4 leaf stage of corn gave poor weed control and some corn injury.

The use of various urea herbicides as early post-emergence sprays gave good control of annual weeds with a minimum of corn injury in a number of tests. Rates of 1 and 2 pounds per acre of the DL and IW formulations appeared most promising, applied in early coleoptile or at the 2-3 leaf stage of corn growth.

Post-emergence treatments with the alkanolamine salts of DNBP generally gave good control of annual weeds, with some corn injury in the form of leaf burn, stunting and some yield reduction. Injury was more serious with applications made after the 3-4 leaf stage of corn growth.

A number of trichloro and tetrachloro benzoic acid derivatives were tested in both pre and post-emergence applications. Results appeared to show two patterns of action; severe corn injury and fairly good weed control with some formulations and no corn injury and poor weed control with others. A few abstracts reported the use of various mixtures of herbicides as post-emergence sprays at several stages of corn growth up to layby. Promising materials included amino triazole at 6 and 9 pounds per acre, applied at layby for the control of grass and some broadleaved weeds.

One abstract reported on the use of winter rye seedings for weed control in corn. Results were satisfactory when three cultivations of the corn were made, and when moisture supply was adequate.

Abstracts

Corn yields and weed control following application of various herbicides at the early post-emergence stage. Bayer, D. E., and Buchholtz, K. P. Corn hybrid W575 was planted May 26, 1955, on an area heavilh infested with seeds of foxtail (*Setaria* sp.) and barnyard grass (*Echinochloa crusgalli*). The plots were sprayed on June 14 when the corn was in the third leaf stage and the grassy weeds were just coming into the third leaf stage. Applications of 3-(3,4-dichlorophenyl)-1, 1-dimethylurea as a liquid preparation (DL) and as a wettable powder (IW), 3-(p-chlorophenyl)-1, 1-dimethylurea as a liquid preparation (CMUL) and as a wettable

powder (CMUW), 3-phenyl-1,1-dimethylurea (PDU) as a wettable powder, dinitro-o-sec-butylphenol (DNBP) as the alkanol-amine salt, 2-methyl, 4-chlorophenoxyacetic acid (MCP) as the diethanolamine salt, 2,3,6-trichlorobenzoic acid as the sodium salt (TCB), and a-chloro-N, N-diallylacetamide (CDAA) were made at two rates each in 20 gallons of water per acre. No cultivation was given any of the plots throughout the season with the exception of the cultivated checks which received the equivalent of three cultivations. On July 18 the grassy weeds were harvested from quadrats and the dry weights determined. When the corn was mature the grain was harvested and yields calculated.

Material	Appl. lb/A	Dry wt. grassy weeds-lb/A	Corn yield-bu/A
DL	1	211	70.6**
DL	2	0	82.0
DW	1	93	69.3**
DW	2	0	85.3
CMUL	1	0	80.0
CMUL	2	48	69.3**
CMUW	1	28	80.6
CMUW	2	0	76.6*
PDU	1	1957	48.6**
PDU	2	295	68.0**
DNBP	2	1948	39.3**
DNBP	4	829	62.0**
DL + DNBP	1 + 1	403	68.0**
DL + MCP	1 + 1/2	35	71.3**
TCB	1	3092	28.0**
TCB	2	2852	19.3**
CDAA	2	1974	37.3**
CDAA	4	1234	46.6**
Uncult. check	-	3131	16.0**
Cult. Check	-	-	94.6

Both the 1 and 2 lb/A applications of DL and DW were effective in controlling the weeds, but for some undetermined reason the yields of corn were higher on plots treated with the 2 lb/A rate. In contrast CMUL and CMUW gave good control of weeds at the 1 and 2 lb/A rates but corn yields were somewhat higher on plots treated at the 1 lb/A rate. The plots treated with D and CMU were still essentially weed free at harvest time. There was some apparent corn leaf injury from the urea herbicides, which ranged from mild to severe, immediately following application, but this was soon outgrown. The height of the corn was also reduced for two or three weeks after application but at maturity equaled that of the cultivated checks. Corn stands were not reduced by any of the treatments. (Dept. Agron., Univ. Wisc., Madison, Wisc.)

Herbicides on corn. Bondarenko, D. D., Miller, O. C., and Willard, C. J. Two experiments were conducted, one (Miller) at the Northwest Substation, O.A.E.S., Hoytville, and the other (Bondarenko) on the Agronomy farm, O.S.U., Columbus. Triplicate 4-row plots were used. Rape and foxtail millet were sown to simulate weeds at Hoytville: millet to simulate annual grasses was sown on only the pre-emergence plots at Columbus. There was a heavy natural weed infestation on all plots at Columbus. Pre-emergence at both places; the PGBE ester, isopropyl ester, and alkanolamine salt of 2,4-D were applied at 1½ lb/A; CDAA, CDEA, CDEC, 553T, 3,4-di-

methylbenzoic acid, and chloroacetyl morpholine at 3, 6, and 9 lb/A; 551E and 552I at 2, 4, and 6 lb/A; DNBP at 5, 10, and 15 lb/A; sodium 2,3,6-trichlorobenzoate (HC 1281 S) at 1/2, 1, 1½, 2, 4, and 8 lb/A; sodium chlorobenzoates X33S and X42S and chlorobenzoic acids X33EO and X42EO (Hooker) at 1, 2, and 4 lb/A; CIPC at 8 lb/A; Kuron at 1, 1½, and 2 lb/A; Karmex DW at 1, 2, and 4 lb/A (Columbus only - equipment at Hoytville would not apply it) and 2-chloro-4,6-bis-(diethylamino)-S-triazine (Geigy 444E) at 12 and 18 lb/A. Plots at Columbus and Hoytville were treated post-emergence with DNBP at 2,4, and 6 lb/A when the coleoptile was visible, one week later and two weeks later, and with 3-amino-1,2,4-triazol (Amizol) at 2, 4, and 8 lb/A, when the coleoptile was visible; when 3-4 leaves on corn: sodium 2,3,6-trichlorobenzoate (HC1281S) at 1/2, 1, 1½, 2, 4, and 8 lb/A; PGBE and isopropyl esters of 2,4-D at 1/4 lb/A, 2,4-D amine at 1/2 lb/A, and Karmex W (plus 1/2 lb/A Formula 40) at 1/2 and 1 lb/A. All rates are in terms of the active ingredient. All were applied in 40 gallons spray per acre; in addition, at Hoytville, DNBP was also applied in 10 gpa of spray at the coleoptile stage. Pre-emergence herbicides most satisfactory from standpoint of weed control and crop tolerance were Karmex DW at 1 to 4 lb/A, HC 1281 S at 2 and 3 lb/A, the 2,4-D esters at 1½ lb/A and Geigy 444E at 18 lb/A. CDAA at 6 and 9 lb/A gave satisfactory control of millet, not broadleaves. Kuron was superior to the 2,4-D esters in pre-emergence grass control. Karmex DW at 4 lb/A gave excellent weed control throughout the season. Reinfestation by crabgrass occurred in all other plots. The trichlorobenzoates from Hooker were uniformly inferior to 2,3,6-trichlorobenzoate from Heyden. At the coleoptile stage, DNBP amine gave excellent results at 4 to 7 pounds at Hoytville, and at 6 pounds at Columbus. It also gave excellent results at the same rates one week after emergence with some slight injury to the corn. DNBP amine was equally effective in 10 gallons per acre spray or 40 gallons per acre spray. As heretofore, DNBP sprays later than a week after emergence were more injurious than earlier. Amizol at emergence (Hoytville only) also gave excellent results at 2 pounds per acre with no injury to corn even at 8 pounds per acre. At Columbus a half pound of Karmex W added to a half pound of 2,4-D amine applied a week after emergence gave almost perfect weed control with no injury to the corn and only slight injury at 1 pound. (Contribution of the Ohio Agricultural Experiment Station.)

Pre-emergence, at-emergence and post-emergence sprays on corn. Churchill, B. R. and Grigsby, B. H. Michigan corn hybrid 350 was planted on May 25, at-emergence sprays were made May 27 and post-emergence sprays on June 21. Rates per acre used for pre-emergence sprays were 1 pound for esters of 2,4-D and Kuron; 2 pounds for esters of 2,4-D, Kuron and 9.9 (mixture of tri- and tetrochlorobenzoic acids) and 3 pounds for H33, CDEC and TCB. At-emergence sprays consisted of ½ and 1 pound rates of CMU and 3 pounds of premerge (DNBP). Post-emergence sprays of 2,4-D were made of ½ and 1 pound per acre. Combinations of chemicals with cultivation were also made. Excellent control in the early part of the season of both annual broad leaved weeds and annual grasses was obtained by pre-emergence sprays of all chemicals. When no cultivation was made, chemicals gave only fair weed control in the latter part of the season. No injury to corn was observed from pre-emergence sprays except with TCB which caused considerable bending of the stalks that remained noticable until near the tasseling stage. Post-emergence sprays with the amine of 2,4-D showed malformation of brace roots for the first time since 1948. Stalk and ear counts have been made but not tabulated. Plots have been harvested but yields have not yet been calculated. (Michigan Agricultural Experiment Station, East Lansing, Michigan.)

Comparison of MCP and 2,4-D on corn at three stages of growth. Dunham, R. S. and Jordan, L. S. Amine formulations of MCP and 2,4-D at 4, 8, and 12 oz/A applied as overall and directed sprays on Minhybrid 507 corn were compared. The earliest application was made overall on corn 10 days after emergence when 5 in. tall and in

the 4-leaf stage. The effect of later applications was determined with both overall and directed sprays when the corn was (1) 9-11 in. tall and in the 5-8-leaf stage and (2) at layby. The directed spray wet 1½-2. of stalk in the first application and the lower 6 in. in the layby treatment. Results: The number of broken stalks/plot was compared for MCP vs 2,4-D; for 0, 4, 8, and 12 oz/A; for three stages; and for directed vs overall coverage. More stalk breakage occurred on MCP plots than 2,4-D plots. Stalk breakage increased from 1.2% on unsprayed to 5.6% with 12 oz. Stalk breakage increased from 1.7% at earliest spraying to 2.3% at 9-11 in. stage to 5.3% at layby. Overall spraying resulted in 2.6% more breakage than directed. (Contributed from Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3443, Sci. Jour. Series, Minn. Agric. Expt. Station).

Control of weeds in corn with chemicals. Dunham, R. S. and Jordan, L. S. Ten chemicals were compared for weed control in corn sprayed at recommended times. Premerge at 4 lb/A was applied at coleoptile and layby stages. TCA at 5 lb/A and Dalapon at 2 lb/A were applied at layby; amino triazole at 2 lb/A and Geigy 444 at 2 and 7 lb/A were applied on corn 18 in. tall; amino triazole at 2 lb/A and Geigy 444 at 7 lb/A were applied at layby; SES at 4 lb/A was applied at pre-emergence, 1-2 leaf stage, 3 leaf stage, 5 leaf stage, and layby; CMU at 1 and 2 lb/A was applied at 1-2 leaf stage. Combinations of Premerge at coleoptile plus TCA, Dalapon, Amino triazole, Endothal, or Premerge were compared. Combinations of Premerge at coleotpile plus Amino triazole or Geigy at 18 in. were compared. Premerge at coleoptile plus Geigy at 18in. and plus Geigy at layby was another combination treatment. A mixture of CMU and Premerge and a mixture of CMU and 2,4-D at the 3 leaf stage were compared. Layby treatments of TCA, Dalapon, Amino triazole, and Endothal included 8 oz of 2,4-D ester for broadleaf weeds. All plots were tractor cultivated when needed. Results: Chemicals alone and in combination that resulted in satisfactory weed control and no serious injury to corn were: Premerge at layby, Premorge plus Amino triazole at 18 in. and at layby, Premerge plus Endothal, Premerge plus Premerge, Amino triazole at layby, SES pre-emergence, SES at 1-2 leaf or at 3 leaf plus SES. (Contributed from Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3447, Sci, Jour. Series, Minn. Agric. Exp. Station).

The performance of some chemicals as pre-emergence herbicides for weed control in corn. Fletchall, O. Hale and Dayton L. Klingman. Corn was planted May 26, 1955 and herbicides were applied the next day. Weed counts were made June 14. The untreated check average 2500 weeds per sq. yd., two-thirds of which were weedy grasses. 2,4-D ester at 1.5 lb. per acre resulted in 12 weeds per sq. yd., half of which were broad-leaved -- mainly Pennsylvania smartweed. 2-chloro N-N-diallyl acetamide (CDAA) at 8 or 12 lbs. per acre was less effective than the 2,4-D treatment, and at 4 lb. per acre it was much less effective. 2-chloro-N-N-diethyl acetamide (CDEA) at equal rates was less effective for weed control than CDAA and 2-chloroallyl-diethyl-dithio carbamate (CDEC) was less effective than either. (1-chloropropyl-2)N(3-chlorophenyl) carbamate at 8 and 12 lb. per acre was about equal to the 2,4-D treatment in control of weedy grasses and it was superior in the control of broad-leaved weeds. 2-chloro-4,6-bis(diethylamino)-S-triazine at 4 lb. per acre was not as effective as 1 1/2 lb. of 2,4-D, but the 8 and 12 lb. rates were equal to the 2,4-D treatment in controlling stands of weeds. They were superior to 2,4-D in stunting weeds giving the "cleanest" appearing plots in the experiment. Several benzoic acid formulations were tested at 1 1/2 lb. acid equivalent per acre. 2,3,6-trichlorobenzoic acid was about equal to 2,4-D ester. A mixture of trichlorobenzoic and tetrachlorobenzoic acids was much less effective than 2,4-D and tetrachlorobezoic acid was still less effective than the mixture. Corn did not appear to be damaged by any of these treatments. (Contribution of the Missouri Agricul-

tural Experiment Station and the Field Crops Research Branch, A.R.S., U.S. Department of Agriculture cooperating, Journal Series, No. 1567.)

Some new pre-emergence herbicides on field corn (US 13 variety). Guest, R. T., Beatty, R. H., Tafuro, A. J., and Jack, C. C. Field corn (US 13 variety) was planted May 17, 1955, and a mixture of ragweed and mustard seed was also planted to insure weed population. Application was made one day after planting and plots were triplicated. Plots were irrigated with 1/4 inch of water 24 hours after treatment and again 2 weeks later. No rainfall was recorded during time of application and the season was hot and dry until August. Materials used were 2,4-D and 2,4,5-T acetamides (75% wettable powders) each at 2 and 4 lb/A; Weedone LV-4 (low volatile butoxy ethanol ester) and Weedone 48 (ethyl ester) each at 1, 2, and 4 lb/A; 1281-S (sodium trichlorobenzoates, Heyden Chem Co.) at 1, 2, and 4 lb/A; X-33-S (sodium polychbrobenzoates, Hooker Electro Chem. Co.) at 1, 2, and 4 lb/A; ACP L-970 (emulsifiable formulation of X-33 polychlorobenzoic acids, Hooker Electro Chem Co.) at 1, 2, and 4 lb.A; ACP L-857 (75% wettable formulation of X-33 polychlorobenzoic acids, Hooker Electro Chem. Co.) at 1, 2, and 4 lb/A; X-42-S (sodium polychlorobenzoates, Hooker Electro Chem Co.) at 1, 2, and 4 lb/A; ACP L-971 (emulsifiable formulation of X-42 polychlorobenzoic acids, Hooker Electro Chem. Co.) at 1, 2, and 4 lb/A; ACP L-914 (75% wettable formulation of X-42 polychlorobenzoic acids, Hooker Electro Chem. Co.) at 1, 2, and 4 lb/A; 4-chloro ethanol at 1, 2, and 4 lb/A; chloro diethyl acetamide (Monsanto Chem. Co.) at 3 and 6 lb/A; chloro thio carbamate (Monsanto Chem. Co.) at 3 and 6 lb/A; chloro diallylacetamide (Monsanto Chem. Co.) at 3 and 6 lb/A. Results: Observations over a 10 week period indicate that 1281-S at 4 lb/A gave excellent control of both monocots and dycots but caused excessive injury to corn in the form of stunting and bracer root injury. X-33-S, although only half as active on weeds, showed no significant corn injury. Two lb/A of 1281-S gave good weed control. At every rate, ACP L-970 was superior to X-33-S in weed control, but was more injurious to corn. Weedone 48 at 4 lb/A gave good weed control with slight corn injury. Weedone LV-4 at 4 lb/A gave slightly less control than Weedone 48 at the same rate, however, 1 and 2 lb/A of Weedone LV-4 continued to give good weed control while Weedone 48 at equal rates was less effective on weeds. 2,4-D acetamide at 4 lb/a was equal in activity to Weedone 48 at 4 lb/A, and showed no significant injury. Two lb/A was superior to Weedone 48 at 2 lb/A, and equivalent to Weedone LV-4 at 2 lb/A. 2,4,5-T acetamide was less active than 2,4-D acetamide at all rates and showed moderate to serious corn injury at 4 lb/A. All other treatments gave significantly less weed control. Contributed by Agr. Res. Div., American Chemical Paint Co., Ambler, Pa.).

Post-emergence application of some herbicidal chemicals for controlling weeds in corn. Hart, R. D. and Rogers, B. J. On June 30, 1955, Alpha-chloro-N,N-diallylacetamide and 2-chloroallyl diethyl-dithiocarbamateat 4, 8 and 16 lbs/A, a polychloro benzoic acid mixture at 3, 6 and 9 lbs/A, and 2-chloro-4,6-bis-(diethylamino)-s-triazine at 12 and 24 lbs/A -- in 60 gal. of water/A -- were applied to corn 14 in. in height. The soil was a Toronto silt loam located in an area just north of Lafayette, Indiana. There was no significant rain for 14 days before the treatment, but 2 days after the treatment, 0.5 in. of rain fell. Maximum temperatures during the period ranged from 77° to 92°F. The acetamide at these rates was somewhat deleterious to the corn, but not critically so. At 16 lbs/A it did not give nearly the control of grasses (Echinochloa crusgalli, Digitaria sanguinalis) that 4 lbs. did when applied as a pre-emergence spray. There was a 70% reduction in broadleaves (Mollugo verticillata, Polygonum ssp., Euphorbia ssp., Ambrosia artemisiifolia, Portulaca oleracea, Hibiscus trionum) at the 16 lb. rate. The dithiocarbamate was more injurious to the corn than the acetamide, but gave much less weed control. The polychlorobenzoic acid mixture was the most effective in controlling both

grasses and broadleaves, but it severely damaged the corn — although not as much as a pre-emergence treatment at the same rates. The triazine gave results equivalent to those cited for the acetamide — that is, some weed control at the highest rate, along with some injury to the corn. (Contribution by the Dept. of Botany and Plant Path., Purdue Univ., Agric. Expt. Sta.)

Pre-emergence application of some herbicidal chemicals for controlling weeds in corn. Hart, R. D. and Rogers, B. J. Alpha-chloro-N,N-diallylacetamide and 2-chloroallyl diethyldithiocarbamate at 4, 8 and 16 lbs/A, a polychlorobenzoic acid mixture at 3, 6 and 9 lbs/A, and 2-chloro-4,6-bis-(diethylamino)-s-triazine at 12 and 24 lbs/A -- in 60 gals. of water/A -- were applied as pre-emergence treatments to corn on June 23, 1955. The plots were located on a Toronto silt loam area just north of Lafayette, Indiana. There was no significant rain for 7 days before and 9 days after application. Maximum temperatures during this period ranged from 75° to 90° F. The acetamide gave the best overall results - the grasses (Echinochloa crusgalli, Digitaria sanguinalis) were reduced 60 to 80% and the boradleaves (Mollugo verticillata, Euphorbia sp., Hibiscus trionum, Ambrosia artemisiifolia) were reduced 40 to 60% over the controls. There was a minor amount of injury to the corn at the rates used. The dithiocarbamate was about one-half as effective on the grasses and broadleaves, and caused less injury to the corn. The polychlorobenzoic acid mixture at the two higher rates completely eradicated all weeds - and caused severe stunting of the corn. The triazine at the rates used was almost as effective as the acetamide, and had a corresponding effect on the corn. (Contribution by the Dept. of Bot. and Plant Path., Purdue Univ. Agric. Expt. Sta.)

The effect of amine and ester preparations of 2,4-D and an amine preparation of DNBP on corn at different stages of growth. Johnson, B. G. and Buchholtz, K. P. Corn hybrid W575 was drill-planted on May 13, 1955. A randomized complete block design was used with single row plots 20 feet long in 4 replications. The corn was sprayed at the 2nd, 4th, 6th, and 8th leaf stage with the alkanolamine salt (2,4-DA) and the isopropyl ester (2,4-DE) of 2,4-D applied at 1/2, 1, and 2 lb/A, and DNBP at 2,4, and 8 lb/A. All materials were applied as an overall spray in water equivalent to 20 gal/A. Two cultivations were made during the summer months to control the weeds between the rows. The application dates were May 26, June 3, June 15, and June 22 for the 2nd, 4th, 6th, and 8th leaf stage, respectively. At maturity the heights were taken from 10 plants in each plot, using the ear node as a measure of plant height. The corn was then harvested and the yields of grain calculated.

Material	Appl. lb/A	Corn yield at various treatment stages - bu/A			
		2nd leaf	4th leaf	6th leaf	8th leaf
2,4-DA	1/2	116.0	104.2	104.5	103.7
	1	116.0	101.8	100.2	96.7*
	2	104.2	99.5	90.8**	94.3*
2,4-DE	1/2	108.3	111.3	105.6	104.7
	1	72.0**	91.8**	99.8	104.0
	2	42.2**	73.6**	83.5**	98.8
DNBP	2	108.3	108.7	108.0	102.3
	4	107.3	108.9	112.5	77.3**
	8	106.6	104.0	102.6	41.3**
Check	-		109.2		

Statistical analysis of the data showed that for both height and yield the differences between stages, rates, and chemicals, and the stage x chemical interaction, were highly significant. For plants treated with 2,4-DA and DNBP, heights were significantly reduced at the higher application rates at the 6th and 8th leaf stages. In contrast, heights of plants treated with 2,4-DE were significantly reduced with the higher application rates at the 2nd and 4th leaf stages. The reduction in height with 2,4-DE was due to the severe leaf rolling or "onion leafing" at the earlier stages whereby the growing points were confined and elongation reduced. DNBP at the early stages caused some stunting, but this was rapidly overcome within several weeks. 2,4-DA showed some leaf rolling after the 2nd leaf stage, but it was never as severe as with the ester preparation. There was a signficant reduction in yield with 2,4-DE at 1 and 2 lb/A at the 2nd and 4th leaf stage, while 2,4-DA showed no significant difference from the check at the 2nd and 4th leaf stage at any rate and DNBP showed no significant difference from check except at the 8th leaf stage with 4 and 8 lb/A.

From the data it can be seen that up to 2 lb/A of 2,4-DA was applied without injury at the 2nd and 4th leaf stage. This provided good control of germinating and seedling annual grassy and broadleaf weeds and left a soil residual which persisted for several weeks without affecting the corn yield. The data also show that DNBP could be used without injury up to 8 lb/A on corn up through the 6th leaf stage for grass control. Use of 2,4-DE at rates up to 2 lb/A at the 2nd and 4th leaf stage was much more hazardous than use of 2,4-DA. (Dept. of Agron., Univ. of Wisc., Madison, Wisc.)

Amino triazole in corn. Robinson, E. L., Bondarenko, D. D. and Willard, C. J. Six-rod strips of corn, 40"-48" high, previously not cultivated, containing crabgrass (12" high), redroot pigweed and lambsquarters (12"-30"), were directionally sprayed (to treat corn bases only) with Amizol at 1/2, 1, 3, 6, and 9 lb/A in 80 gpa spray. The 6 and 9 lb/A rates gave 100 percent kill of all three weeds with no regrowth the remainder of the season; the 3 lb/A rate was slightly less effective; the 1/2 and 1 lb/A rates caused severe stunting. There was slight apparent injury to corn at the 9 lb/A rate, none at the lower rates. In another field, cultivated as usual, triplicate plots of corn at tasseling directionally sprayed with Amizol at 1/4, 1/2, 1, and 2 lb/A in 40 gpa spray gave 83, 93, 98 and 100 percent control, respectively, of quickweed (Galinsoga parviflora), redroot pigweed and ryegrass, approximately 4 inches high, with no apparent injury to corn. (Contribution Ohio Agricultural Experiment Station.)

Winter rye for weed control in corn. Robinson, R. G., Jordan, L. S. and Dunham, R. S. Immediately after corn was planted, rye was sown at 1 bu/A with a grain drill over all plots except tractor-cultivated checks. Treatments included 3 cultivations on check plots vs 3 cultivations, 2 cultivations or 1 cultivation on plots sown to rye. The rye between the rows was destroyed by the first tractor cultivation on the plots cultivated 3 times, at the second cultivation on the plots cultivated twice, and at the third cultivation on the plots cultivated once. Results: Weed control was unsatisfactory on the plots cultivated once or twice and satisfactory on those cultivated 3 times. Plots cultivated once or twice were significantly lower in yield than the check. In one trial under dry soil conditions the rye plots cultivated 3 times yielded less than the check but in a second trial under better moisture conditions these plots yielded as well as the check. The early and thick emergence of the rye serves as early protection against erosion. (Contributed from Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3444, Sci. Jour. Series, Minn. Agric. Exp. Station).

Pre-emergence applications of polychlorobenzoic acids and salts for weed control in corn. Rogers, B. J. and Hart, R. D. On May 25-26, 1955, two mixtures of polychlorobenzoic acids, as the acid and as the sodium salt, were applied at rates of 1.5, 3 and 4.5 lbs/A in 30 gals. of water/A to corn prior to emergence. The soil was a Chalmers silty clay loam located in an area just North of Lafayette, Indiana. During the week before application, over 2.0 in. of rain fell; in the week following, over 1.0 in. The maximum temperatures ranged from 58° to 84° F. Mixture 1 is composed of tri- and tetrachlorobenzoic acids and mixture 2 is essentially tetrachlorobenzoic acid. Some stem curvature and delayed unrolling of leaves was caused by the 3 and 4.5 lb. rates for both mixtures. Mixture 1 in the acid form seemed to be most effective in controlling both grasses and broadleaves. At 1.5 lbs/A, grasses were not controlled; at 3 and 4.5 lbs/A the grass population (represented mainly by Setaria ssp., Echinochloa crusgalli, Digitaria sanguinalis) was reduced by 35-40%. At 1.5 lbs/A broadleaves (represented by Hibiscus trionum, Mollugo verticillata, Ambrosia artemisiifolia, Polygonum ssp., Euphorbia ssp., Amaranthus retroflexus) were reduced 40%; at 3 and 4.5 lbs/A they were reduced by 70%. (Contribution by the Dept. of Bot. and Plant Path., Purdue Univ. Agric. Expt. Sta.)

Post-emergence applications of polychlorobenzoic acids and salts for weed control in corn. Rogers, B. J. and Hart, R. D. Two mixtures of polychlorobenzoic acids, as the acid and as the sodium salt, were applied at rates of 1.5, 3 and 4.5 lbs/A in 30 gals of water to corn 6 in. in height on June 7, 1955, and at rates of 3, 6 and 9 lbs/A in 60 gals of water to 10 in. corn on June 20, 1955. The soil was a Chalmers silty clay loam located in an area just north of Lafayette, Indiana. The June 7 application was applied just after 1.6 in. of rain and just before 0.5 in. of rain. There was no significant rain for 4 days before and 12 days after the June 20 application. Maximum temperatures ranged from 55° to 86° F. Mixture 1 is composed of tri- and tetrachlorobenzoic acid. The 6 in. corn, at the 3 and 4.5 lb. rates, suffered extensive contact injury from both mixtures in the acid form - possible due to xylene in the formulations, although subsequent tests with proportionate concentrations of pure xylene were not nearly so damaging to corn. At this stage grasses (Setaria ssp., Digitaria sanguinalis, Echinochloa crusgalli) were not controlled. Broadleafs (Hibiscus trionum, Polygonum ssp., Euphorbis ssp., Ambrosia artemisiifolia, Mollugo verticillata) control ranged from 65% for mixture 1, acid form - 3 lbs/A, to 20% for mixture 2, sodium salt - 1.5 lbs/A. Some curvature of the corn stems was noted. The 10 in. corn, on the other hand, was not nearly as sensitive to contact injury from the acid formulations, even at the much higher rates. Grass control was still not obtained. Mixture 1 in the acid form was most effective in controlling broadleaves at this stage, and a reduction in the population of some 80% was obtained. (Contribution by the Dept. of Bot. and Plant Path., Purdue Univ. Agric. Expt. Sta.)

Post-emergence herbicides on corn. Slife, F. W. and Gantz, R. L. Corn hybrid U.S. 13 was planted June 6, 1955 and divided into a randomized block design with 4 replications. Plots were 2 rows wide and 12 hills long. Treatments were made when the corn had 2 to 3 leaves, approximately 3 inches tall, and when it was approximately 12 inches tall. Sprays were applied in 18 gal of water per acre over the top of the corn. Chemicals used and rates of application in lbs of acid per acre were: CDAA (Diallylacetamide) 4 & 6 lbs, CDEA (Diethylacetamide) 4 & 6 lbs, CDEC (Diethydithiocarbamate (4 & 6 lbs, Dalapon 3 & 4 lbs, 6249 (trichloroproponic acid) 3 and 4 lbs, and CMU (3-(p-chlorophenyl)-1, 1-dimethyl urea) 1 and 2 lbs. Excellent grass control was obtained with all materials at the 1st treatment date at all rates of application. CMU was particularly outstanding because of its complete control of all broadleaf weed species present. There were no weeds present the 2nd date. CDAA, CDEA, and CDEC produced moderate leaf burning, which disappeared shortly. Dalapon

and 6249 retarded corn growth at both dates of application and at both rates. Dalapon was much more toxic to the corn than 6249. Although the yields have not been analyzed, CDAA, CDEA, CDEC, and CMU have not apparently reduced yields at either rate at either treatment date. Dalapon reduced yields severely at both treatment dates. 6249 reduced yields approximately to 1/2 of the untreated plots at both treatment dates. (Contribution of the Department of Agronomy, Illinois Agricultural Experiment Station).

The effect of various pre-emergence herbicides on corn. Slife, F. W. Corn hybrid U. S. 13 was planted on May 18, 1955 on a black clay loam. Pre-emergence chemicals were applied immediately after planting. A randomized block design with 4 replications was used with each individual plot 2 hills wide and 12 hills long. Chemicals used and rates of application in lbs of acid per acre were: CDEC (Diethyldithiocarbamate) 3, 4, and 5 lbs; CDAA (Diallylacetamide) 3, 4, and 5 lbs; CDEA (Diethylacetamide) 3, 4, and 5 lbs, 2,4-D ester 1½ lbs, Geigy 444 8, 10, and 12 lbs, Hooker x 33 benzoic acid, 1, 2, and 3 lbs, Heydon benzoic acid 1, 2, and 3 lbs, DNBP 8 and 10 lbs, CDEC 3 lbs + 2,4-D ester 1 lb, CDAA 3 lbs + 2,4-D ester 1 lb. Good rains fell soon after chemical application giving ideal conditions for pre-emergence herbicides. CDEC, CDAA, and CDEA were particularly outstanding in controlling annual grasses without corn injury. Although all 3 of these chemicals reduced the stand of broadleaf weeds, control of these species was minor in comparison to grass control. 2,4-D ester gave 100% control of broadleaf and 75% control of grass weeds. Geigy 444 gave excellent control of some broadleaf species but only minor control of grass weeds at the rates included in these tests. Hooker benzoic acid was much less effective than the Heydon benzoic and even at 3 lbs did not give acceptable weed control. Heydon benzoic gave better broadleaf control than grass control but at the 3 lb rate gave 100% control of broadleaf and grasses. At the 3 lb rate of Heydon benzoic the corn was injured, indicating it had moved into the corn root zone. This injury was in corn stunting which affected the final yield. DNBP gave excellent control of both broadleaf and grass weeds at both rates, but the corn was affected at the 10 lb rate. There was a slight reduction in yield as a result of this injury. The outstanding plots were CDAA at 3 lbs = 2,4-D ester at 1 lb and CDEC at 3 lbs + 2,4-D ester at 1 lb. Both treatments gave excellent control of both grasses and broadleaf weeds without corn injury. (Contributed by the Department of Agronomy, Illinois Agricultural Experiment Station).

P re-emergence herbicides for weed control in corn. Staniforth, D. W. Several experimental herbicides were evaluated in a field screening test. No yields of corn were obtained, weed control was estimated using a numerical scoring system. Materials were applied immediately after seeding on May 5. Soil was moist at the time of treatment, and 1½ inches of rain occurred May 9. Weed control ratings were determined four weeks after planting. The materials used and the weed control ratings are presented in the following table.

Experimental material	Rate in lb. per acre	Weed control ratings: Grass	Red root pigweed	Other B-leaf	Crop injury
Check	---	5	5	5	none
Geigy 444	8	1	1	1	none
	12	1	1	1	none
	16	1	1	1	none

Table continued from previous page

Experimental material	Rate in lb. per acre	Weed control ratings: Grass	Red root pigweed	Other B-leaf	Crop injury
CDEC	2	5	5	5	none
	4	5	5	5	none
	6	3	4	4	none
CDAA	2	2	3	3	none
	4	1	1	1	none
	6	1	1	1	none
CDEA	2	3	4	4	none
	4	1	1	1	none
	6	1	1	1	none
Isopropyl ester of 2,4-D	1	4	4	4	none
	2	2	2	2	none
	3	2	1	1	none

Explanation of scoring system. 1= mostly weed-free, survivors few and stunted.
2= fairly good weed control but not good.
3= about 50 percent control, compared to check.
4= very weedy, no real control.
5= like or worse than the check in weed numbers.

(Contribution from Iowa Agricultural Experiment Station, Ames, Iowa.)

Post-emergence herbicides on corn. Staniforth, D. W. Field corn was seeded May 2 in an area heavily infested with annual weeds including yellow and green foxtail. Herbicide materials were applied in 40 gallons of water per acre on May 11. At this date corn had 1-2 leaves emerged and the soil was crusted from a 1½ inch rain on May 9. Weed seedlings were 50 percent emerged and in the 1-3 leaf stage. No rain occurred for three weeks following the treatments. Materials tested included 3-(3,4 dichlorophenyl)-1,1-diethylurea wettable powder (DW) at 2 and 4 pounds per acre, dinitro-o-sec-butylphenol (DNBP) as alkanolamine salt at 3 and 6 pounds per acre and the amine salt of 2,4-D at 1 and 2 pounds per acre. All rates of all three materials, except three pounds of DNBP, gave good to excellent control of annual weeds including grasses. Check plots were cultivated May 18, and all plots were cultivated May 31 and once more in early June. The treatments with DW at 4 pounds per acre caused a slight stunting of corn, but no yield reduction. Two pounds per acre of DW gave as good weed control as 4 pounds per acre when followed by later cultivations, which maintained all plots including the checks in a very clean condition for the rest of the season. DNBP caused some leaf burn on the corn at the 6 lb. rate but did not result in any yield reduction.

In a second test CDAA at 4 pounds per acre and the amine salt of 2,4-D were applied to corn in the coleoptile stage. Both materials gave excellent control of annual grasses and purslane. CDAA did not control other broadleaved weed species such as red root pigweed. Neither CDAA nor 2,4-D resulted in any observable corn injury, and no yield reductions compared with weed-free checks. (Contribution from Iowa Agricultural Experiment Station, Ames, Iowa.)

Flax

R. G. Robinson

Summary

TCA, at about 5 lb/A alone or in combination with 2 to 4 oz MCP or 2,4-D in amine formulation, on established flax gave good control of Setaria species and resulted in slight or no injury to flax. TCA at 6 lb alone or in combination with MCP at 6 oz reduced flax yield. Germination of seed harvested from TCA sprayed flax was slightly lower than that of seed from unsprayed plots. In a fiber variety, TCA at 5 or 10 lb/A reduced seed yield. In one of three years, 5 lb TCA reduced yield of line fiber but not yield of total fiber.

Dalapon when used at rates of more than 1 lb/A on established flax delayed maturity and reduced yield of flaxseed. In one trial, Dalapon pre-emergence at 3 or 6 lb/A reduced flaxseed and straw yields; post-emergence application of 1½, 3, or 6 lb/A reduced yield when applied at any of five stages of growth. Seed yields showed greatest reduction when spraying was done during the bud and flowering period. The Dalapon formulation without a wetting agent has previously been shown to be less injurious to flax than the standard formulation. Dalapon gave excellent control of Setaria species when used at rates/A of 1 lb or more.

CMU at 1 or 2 lb/A when flax was 3 in. tall resulted in higher flax yields at one location than were obtained with TCA, but CMU did not give as good control of green foxtail.

2,2,3-trichloropropionate at 4 lb/A was not as effective on green foxtail as 4 lb TCA or 1 lb Dalapon. It did not appear to damage flax.

Pre-emergence applications of CDAA at 3 or 6 lb/A or of CDEA at 6 lb/A gave good control of Setaria species in some trials and no flax injury. CDAA was superior to CDEA. Post-emergence application of CDAA or CDEA was less effective on weeds than pre-emergence and injured flax although the flax recovered. In some trials reported in the annual weed section of this report, pre-planting applications of CDAA when mixed in the surface soil injured flax.

CDAA pre-emergence was reported to give good control of wild oats in some trials, but in other trials CDAA, CDEA, or CDEC did not control wild oats in flax. Moist soil conditions after spraying were favorable to control of wild oats. One investigator working with MH at ½ lb/A concluded that the time of floral and reproductive development of Redwing flax was not sufficiently different than that of wild oats to permit selective destruction of seed viability.

MCP was less injurious to flax than was 2,4-D at equal rates and in similar formulations. MCP amine in general was the best general-purpose formulation. 2,4-D ester was the best formulation for controlling Russian thistle in flax. Standard and low volatile esters were reported equal in weed control and effect on flax, except in one case where a low volatile formulation was reported more injurious to flax.

Abstracts

Effect of various herbicides in the control of weeds in Redwood and Marine flax. Bakke, A. L. Replicated square rod plots of Redwood and Marine varieties of flax grown at Kanawha, Iowa in the northern part of the state were planted on

April 15, 1955 and sprayed on May 17, when the flax was 3 in. in height, the broad leaf weeds principally, annual smartweed, and the grass weeds 2-5 leaves, with MCP ¼ lb/A, Dalapon 2 lb/A, 2,4-D (LV4) ¼ lb/A, MCP + TCA (¼ lb + 5 lb/A), TCA sodium salt 5 lb/A. The flax was harvested on July 21 along with the broad leaf weeds and foxtail. The maximum yield for the Redwood flax was 19.97 bushels per acre. The 2,4-D compounds controlled the broad leaf weeds like the annual smartweed, while TCA, at 5 lb/A controlled the foxtail. Dalapon at 2 lb/A gave good grass control but injured the flax and retarded its development. From the experimental results it may be concluded that MCP and TCA (¼ lb/A + 5 lb/A) gave the best control measures for the control of both the broad leaf and the grass weeds. (Iowa Agricultural Experiment Station. Ames, Iowa).

Effect of TCA, CMU and Dalapon alone and in combination with MCP sodium salt on linseed flax and on grassy and broad leaved weeds in flax. Brown, D. A. The Rocket variety of flax was used for this experiment. Treatments were applied when the flax was 3 in. high. MCP sodium salt was in all instances applied at 6 oz/A acid equivalent.

Results:

TCA treatments		CMU treatments		Dalapon treatments	
Herbicide, lb/A	Flax bu/A	Herbicide, lb/A	Flax bu/A	Herbicide, lb/A	Flax bu/A
0	20.9	0	22.9	0	21.5
3 TCA	21.1	½ CMU	25.2	½ Dal.	20.7
6 "	18.5	1 "	24.7	1 "	20.6
12 "	16.0	2 "	22.6	2 "	13.2
3 TCA + MCP	20.2	½ CMU + MCP	22.6	½ Dal. + MCP	20.7
6 "	17.9	1 "	23.3	1 "	20.3
12 "	17.0	2 "	22.3	2 "	15.3
MCP	21.8	MCP	23.0	MCP	22.7

This experiment was in its fifth year. Dalapon was first tested in 1953. It has consistently depressed the yield of flax. In 1954-55 CMU has given significantly higher yields than TCA. TCA obviously injured the crop when applied in excess of 3 lb/A.

The crop was moderately infested with green foxtail, wild oats, lambsquarters, redroot pigweed, stinkweed and wild buckwheat. TCA gave best control of green foxtail but at the expense of reduced yield of flax. CMU required an application of 1 to 2 pounds to get satisfactory control of this annual grass. In combination with 6 oz/A MCP sodium salt, TCA again gave slightly better weed control than CMU. In all counts Dalapon gave disappointing weed control and because it distinctly injured the flax it does not appear to be a satisfactory treatment for weeds in this crop. None of the treatments controlled wild oats. (Contributed by: Experimental Farm, Brandon, Manitoba).

MCP vs 2,4-D for control of annual weeds in flax. Brown, D. A. The land was artifically infested with weed seeds prior to drilling flax. Prevalent in the crop were lambsquarters, redroot pigweed, stinkweed, and to a lesser extent, false ragweed, Russian thistle, and wild buckwheat. Treatments included 2,4-D low volatile ester, 2,4-D standard butyl ester, 2,4-D amine and MCP in the form of ester, amine, and sodium salt. All were applied at 4 and 8 oz/A acid equivalent at two stages in crop and weed growth i.e. (1) weeds early seedling - flax 3 in. (2) weeds 1 to 3 in. - flax 6 to 7 in.

Results: Percentage overall weed control; 2,4-D low volatile ester 91.2, 2,4-D butyl ester 88.5, 2,4-D amine 65.5, MCP ester 87.8, MCP amine 77.2, and MCP sodium salt 77%. The influence of stage of growth showed 78.9% control at stage (1) and 82.5% at stage (2). Rates regardless of formulation gave a 75.4% control at 4 oz/A and 85.5% at 8 oz/A. 2,4-D amine gave the poorest results. At the 4 oz rate this formulation gave satisfactory control of only lambsquarters and stinkweed, and at the 8 oz rate redroot pigweed was only moderately controlled. Russian thistle and wild buckwheat were fairly well controlled at the 8 oz rate of the low volatile and standard ester, to a lesser extent with MCP ester but the amines and sodium salt of both 2,4-D and MCP gave poor control even at the 8 oz rate. (Contributed by Experimental Farm, Brandon, Manitoba).

MCP vs 2,4-D for linseed flax. Brown, D. A. The following formulations were used on the Rocket variety of flax: 2,4-D low volatile ester, 2,4-D standard butyl ester, 2,4-D amine, and MCP in the form of ester, amine, and sodium salt. All were applied at 4 and 8 oz/A acid equivalent at two stages of growth: (1) when flax was 3 in. high, (2) when flax was 6 in. high (one week before first sign of buds).

Results: Yields in bu/A average of dates and rates: 2,4-D low volatile ester 23.6, 2,4-D standard butyl ester 23.4, 2,4-D amine 26.9, MCP ester 27.2, MCP amine 26.4, MCP sodium salt 26.3, and check no treatment 23.1. Stage of growth did not influence yield. At the early stage, average yield from all treatments was 25.3 bu/A compared with 25.1 bu/A for the later stage. Likewise rate of application gave no significant difference, the 4 oz rate yielding 25.8 bu/A and the 8 oz, 25.5 bu/A.

Discussion: The crop was moderately to heavily infested with weeds. Treatments gave fair to very thorough control. The low yield on the check plots was a result of weed competition. The low volatile and standard butyl esters significantly lowered yield compared with other treatments but they gave excellent weed control. MCP ester was the outstanding treatment. Amine of 2,4-D gave disappointing weed control but sufficient to reduce competition and enhance the yield of flax. The 2,4-D esters caused severe wilting of flax plants. Heavy damage was anticipated but within two weeks recovery was good and from that time the crop appeared normal. (Contributed by Experimental Farm, Brandon, Manitoba).

Effect of different formulations of MCP and 2,4-D on annual weeds in flax. Breakey, W. J. Formulations of MCP ester, amine and sodium salt, and 2,4-D ester and amine and low volatile ester were applied at rates of 4 and 8 oz on flax. Six randomized plots for each treatment were used making a total of 150 plots. Previous to seeding of flax heavy seeding of weed seeds was broadcast over the area. Plots were 6' x 8' in size. Spraying was done by a small boom sprayer with pressure remaining constant. Two dates of spraying were used. The first when flax plants were 3 to 5 in. high, the second date just prior to bloom of flax.

Results: Part 1. First date spraying on all plots. Sprayed with the MCP formulations at both rates, the yield of flax ranged from an increase of two bushels to 5.3 bushels per acre over the check plot. The 2,4-D ester and amine plots gave much smaller increases of from only 0.4 bu to 2.8 bu/A. The low volatile treatments proved too severe with increases of only 1.3/A. The second date sprayings were significantly lower, ranging from no increase to 4.1 bu increase with sodium salt. The average yield for the 3 MCP treatments at two rates was 15.9 bu against 14.3 for the checks, while the average yield for the 2,4-D treatment was only 11.2 bu, 3.1 bu below the checks. The low volatile treatments averaged only 9.9 bu/A as

against 14.3 for the checks.

Part 2. First spraying. Superior weed control was secured with the early or first spraying. The dry weight yield of weeds in grams ranged from a low of 1.7 gm to 14.7 gm with an average of 5.4 gm/plot. Second spraying. The dry weight yield of weeds ranged from 34.2 gm to 160 gm with an average of 121.3 gm/plot. The dry weight of seeds on checks averaged 197.8 gm. The season in general was hot and dry. Favorable weather conditions prevailed at time of each spraying. (Contribution of the Dominion Experimental Farm, Morden, Manitoba).

The effect of TCA on fibre flax when applied as a post-emergence spray, 1952-54. Chubb, W. O. and E. M. MacKey. TCA (sodium salt) was applied to weed free L. Dominion flax (total spray volume 11½ gal (Imp.)/A) at the rates of 0, 5, and 10 lb acid equivalent/A alone and in combination with 3 oz acid equivalent/A of 2,4-D amine. At the time of treatment the flax was 3 to 5 in. tall in 1952, 4 to 5 in. tall in 1953 and 7 to 9 in. tall in 1954. Plot size was 1/160A in 1952 and 1/100A in 1953 and 1954. A randomized block design was used in 1952 and split plot designs in 1953 and 1954. Treatments were carried out in triplicate in all years. Seed yields were determined and the straw was water retted for fibre extraction. In 1952 only the combined 3 oz 2,4-D and 10 lb TCA treatment significantly reduced seed yields; in 1953 and 1954 seed yields were reduced by 5 lb TCA and further reduced by 10 lb TCA (2,4-D X TCA interaction not significant). In 1952 the yields of total fibre and line (long) fibre were reduced by the combined 3 oz 2,4-D and 10 lb TCA treatment; in 1953 the total fibre yields were reduced by the 10 lb TCA and the line fibre yields by both 5 and 10 lb TCA (2,4-D X TCA interaction not significant); in 1954 the fibre yields were not significantly reduced by any of the treatments. (Contribution of Canada Department of Agriculture, Special Crops Substation, Portage la Prairie, Manitoba).

Effect of dalapon on various growth stages of oats, flax and rape. Ebell, L. F. and Corns, W. G. Separate experiments were sown on May 31, 1954 to Victory oats, Redwing flax and Argentine rape to determine possible selective control with dalapon of wild oats in the oil seed crops. Four rows of crop were seeded in the rod length plots. The split plot design provided for 6 dates of treatment at 0, 1.5, 3 and 6 lb/A of Dalapon. Crops were treated before emergence, 1-2 days after emergence and at 4 intervals between advanced seedling and post-flowering stages. Rape was harvested Sept. 22, oats Oct. 1, and flax Oct. 5, and data obtained on seed and straw yield.

Grain yield of oats was severely reduced by the 6 lb rate up to the shot blade stage. The most susceptible stage with both the 3 and 6 lb rates occurred 25 days after emergence when yield was reduced to 44 and 5% of check respectively. Straw yield and bushel weight were also most adversely affected at this date.

Yield of flax seed was impaired by all 3 and 6 lb treatments until flowering was almost complete. The 1.5 lb rate significantly reduced yield from emergence until 36 days after emergence. Flax was most susceptible 36 days after emergence when plants began flowering and buds were plentiful. Yields were reduced to 79, 38, and 8% of check by the three rates at the above date of treatment. Straw yield of flax was not reduced except by the 3 and 6 lb rates applied before emergence. The seed yield of both flax and rape was most reduced by Dalapon treatment during the bud and flowering period. In flax, bud-opening was inhibited or delayed. The blue petals in partially opened buds or fully opened flowers lost most of their color and were almost white in appearance. The buds of treated rape plants did not appear to be adversely affected but petal color was changed to a much lighter shade of yellow.

The stand of rape was not affected by any rate of Dalapon or date of treatment but significant seed reduction occurred from 6 lb applied at 9, 26, and 43 days after emergence and from all rates applied 43 days after emergence. In addition there was a trend towards yield reduction from a 6 lb application before and immediately after emergence that points to a need for further study before this short period of least susceptibility to Dalapon could be utilized for selective weed control. (Division of Crop Ecology, Department of Plant Science, University of Alberta, Edmonton, Alberta).

A comparison of TCA (post-emergence) and alpha-chloro-acetamides (pre-emergence) for weed control in flax. Helgeson, E. A. Marine flax was planted in a loose dry seedbed of Fargo clay on May 11, 1955. On May 20 the acetamides were applied to the soil surface which was still dry. A total of 1.67 inches of rain fell in a five day period after treatment. On June 23 the plots receiving TCA were treated. At this time the flax was 6-8 in. tall and Setaria ranged from emerging to 6 in. tall. On June 25, 2 oz of 2,4-D amine/A was applied to all plots. On August 17, 50 ft of row per plot was harvested and bagged. After drying, threshing, and cleaning, the Setaria and flax were hand separated to determine yields of each. Results: One month after treatment 3 lb of alpha-chloro-N, N-diethylacetamide (CDEA) gave poor Setaria and broad-leaf weed control. Six lb of CDEA gave good control of Setaria and slight broad-leaf control. Three lb of alpha-chloro-N, N-diallylacetamide (CDAA) gave good Setaria control and slight broadleaf control, while at 6 lb control of Setaria was nearly perfect with excellent control of broad-leaved weeds (Iva, Amaranthus, Portulaca, and Brassica). The weed control in the plots mentioned above failed to hold after the first month. TCA killed the smaller Setaria and stunted the larger plants. However, this control of Setaria appeared to force grasshoppers on to the flax and extreme damage resulted as seen below.

Treatment	Clean flax yield bu/A	Setaria lutescens seed yield lb/A
Check	1.8	162
TCA 6 lb/A post-emergence	1.4	38 **
CDEA 3 lb/A pre-emergence	1.2	231 **
CDEA 6 lb/A pre-emergence	2.0	212 *
CDAA 3 lb/A pre-emergence	3.3 **	146
CDAA 6 lb/A pre-emergence	4.9 **	148
L.S.D. (.01)	1.0 bu	55 lb

Although all the yields were poor, the benefit of weed control in the first month of growth is clearly reflected in the yields of the CDAA plots, but not in final Setaria seed production. (North Dakota Agr. Exp. Sta., Fargo, N.D.).

Control of green foxtail (Setaria viridis) with TCA, 2,2 dichloropropionic acid, sodium salt (Dalapon), and 2,2,3 trichloroproprionate (A.C.P. -L-705-A). Keys, C. H. An area of fallow heavily infested with green foxtail was sown to Dakota flax the third week of June. When the flax was three in. tall and the green foxtail ranged from the seedling to five leaf stage, replicated, randomized plots, 1/264 acre in size were treated with sodium TCA at 1, 2, 4, 6 and 8 lb/A. Dalapon at ½, 1, 2, 4 and 6 lb/A and A.C.P.-L-705-A at 1, 2 and 4 lb/A. All chemicals were applied in water at 12 gal/A. The ½ lb rate of Dalapon was about 50% effective while the other rates gave 100% control. TCA at the 1 and 2 lb rates were 40 and 72% effective while the 4 and 6 lb rates approached 100% control and the 8 lb rate

provided 100% control. A.C.P.-L-705-A was only 15% effective at the 1 lb rate, 67% effective at 2 lb/A and 85% effective at 4 lb/A. A reduction in the amount of water from 80 to 12 gal/A made no apparent difference in the effectiveness of the chemicals. The 2, 4, and 6 lb rates of Dalapon resulted in a retardation of flax growth that became more severe with the increased rate of the chemical. There was no material reduction in flax growth with TCA, and maturity was not retarded. The new chemical 705-A did not appear to have any damaging effect on the flax. (Contribution from Experimental Farm, Scott, Sask.).

Pre- and post-emergence application of a-chloro-N, N-diallylacetamide, a-chloro-N, N-diethylacetamide and (pre-emergence only of) 2-chloroallyldiethyldithiocarbamate in 1955 at Halstad, Minnesota to control wild oats in wheat, barley, and flax. MacDonald, W. P., Zinter, C. C., and Slough, A. T. The three chemicals mentioned above (technical 95%) were applied at 6 and 3 lb/A both pre- and post-emergence in water solution at 10 gal/A. Applications were made two days after and 7 weeks after seeding. Plots were triplicated and randomized. Visual comparisons indicated little if any control of wild oats or damage to any of the three crops at either rate of application or time of treatment. Soil moisture was low at time of first application and no rain occurred for approximately three weeks after application after which it remained excessively wet until heading. No yields taken. (Contribution of F. H. Peavey & Co., Minneapolis, Minn.).

MCP vs 2,4-D for weeds in flax. Molberg, E. S. Amine, sodium salt and ester forms of MCP, and amine, ester, and low volatile forms of 2,4-D were applied to flax at 4 and 8 oz/A. Applications were made at two dates, the first when the susceptible weeds were less than 6 in. tall and the second when the mustard was in the flower stage. The main weeds present were wild mustard, lambsquarters, dandelion, hemp nettle and ball mustard. Only the lambsquarters and wild mustard were completely killed. The ball mustard was well controlled at the early stage by all formulations except the MCP sodium salt and MCP amine. Hemp nettle and dandelion were damaged but not effectively controlled. The hemp nettle was slightly more susceptible to MCP than to 2,4-D. The MCP caused significantly less damage to the flax than the 2,4-D at corresponding rates and dates of application. Highest yields were obtained from the MCP amine treated plots. Although the differences in weed content were not significant, at harvest time the plots treated with 2,4-D ester at the early stage were the cleanest. 2,4-D ester was more effective than MCP ester, but MCP amine was more effective than 2,4-D amine. The low volatile ester was no more effective than the ordinary 2,4-D. For both MCP and 2,4-D, the ester was more effective than the amine, and the amine MCP gave better results than the sodium salt MCP. (Contributed by the Experimental Farm, Regina, Sask.).

Giant foxtail control in flax. Robinson, R. G., Jordan, L. S. and Dunham, R. S. CDAA, CDEA, CDEC at 6 lb/A were sprayed pre-emergence on Marine flax. TCA at 5 lb/A; Dalapon at 1, 1½, 2, and 2½ lb/A; and CDAA, CDEA, and CDEC at 6 lb/A were sprayed on flax 6 in. tall and on foxtail with 6-7 leaves. All plots were sprayed with 3 oz MCP to control broad-leaved weeds. Results: Successful foxtail control resulted from CDAA and CDEA pre-emergence and from TCA and all Dalapon treatments post emergence. Of these successful treatments, CDAA and CDEA caused no flax injury. TCA caused moderate injury, Dalapon at 1 lb/A slight injury, Dalapon at 1½ lb/A slight to moderate, and Dalapon at 2 and 2½ lb/A severe injury as shown by plant response. Dalapon at 1½, 2 and 2½ lb/A reduced yield. Yields greater than the unsprayed were obtained from CDAA, CDEA, and TCA. CDAA gave excellent foxtail control and yielded significantly more than any other treatment. The germination of seed harvested from the TCA and Dalapon plots was lower than that from the other plots. (Contributed from Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3448, Sci. Jour. Series, Minn. Agric. Exp. Station).

Grass weed control in Marine Flax. Robinson, R. G., Soine, O. C., Bridgford, R. O., Thompson, J. R., Dunham, R. S. and Jordan, L. S. TCA at 5 lb/A and Dalapon at 1, 1½, 2 or 2½ lb/A were compared as grass herbicides in flax. The Dalapon formulation did not contain a wetting agent. Trials were conducted at Crookston, Morris, and Waseca. Yellow and green foxtail were the predominant species. Weeds had emerged and flax was several inches tall when sprayed. Results: All treatments gave good weed control except the 1 lb rate of Dalapon at Morris which gave only fair control. TCA did not visibly injure flax although seed yield was 11% lower than that of the unsprayed plots at Morris. Germination of seed harvested from the TCA sprayed plots was slightly lower than that of seed from unsprayed plots. All rates of Dalapon delayed flax maturity from 4-7 days. Dalapon at 1½, 2, or 2½ lb gave too much flax injury to be considered practical treatments. Dalapon at 1 lb did not reduce flaxseed yield or appreciably affect seed viability. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3451, Sci. Jour, Series, Minn. Agric. Exp. Station).

SOYBEANS

F. W. Slife

Summary

Weeds are best controlled in soybeans by cultural practices, but several pre-emergence herbicides have performed consistently enough to be recommended in problem areas. Post-emergence application of chemicals has not been recommended because of the sensitivity of soybeans to present-day herbicides.

From the abstracts submitted this year, it appears that DNBP and CIPC have given the most consistent results of any chemicals for controlling weeds in soybeans, but Alanap has been outstanding in several tests. Several abstracts indicated excellent annual control of grass with the newer pre-emergence herbicides CDAA, CDEA, and CDEC. These compounds performed well in three states but failed completely in one state. Several other new compounds were tested as pre-emergence herbicides on soybeans, but results will not be summarized because of limited data.

Two abstracts were submitted on post-emergence applications of CDAA, CDEA, and CDEC to soybeans. The results indicate that, when applied as post-emergence sprays, these chemicals may act as contact herbicides rather than translocated herbicides.

Abstracts of Results of Cooperators

Effect of certain chloracetamides on soybeans. Bakke, A. L. Blackhawk soybeans were planted solid on ground that had been previously disked, but not cropped, on July 14 at Kanawha, Iowa. Immediately after planting on July 14 and 15, replicated square rod plots were treated with 3 and 6 lb. of CDAA (alpha-chloro-N,N - diallylacetamide), CDEA (A chloro N-N diethylacetamide), and CDEC (dichloroallyl diethyldithiocarbamate) per acre. On September 28, there was a good stand of beans throughout, and they were of uniform height of 18 inches. There was no apparent effect on the beans. (Iowa Agricultural Experiment Station, Ames, Iowa)

Herbicides on soybeans. Bondarenko, D. D., Miller, O. C., and Willard, C. J. Monroe soybeans were planted May 16 at the Northwest Substation, O.A.E.S., Hoytville, and a Wisconsin selection of soybeans was planted May 25 at Columbus. Triplicated plots from 42-inch rows were laid out. Rape and millet were sown to simulate weeds at Hoytville; a heavy natural weed infestation (pigweed, lambsquarters and crabgrass) occurred at Columbus.

The following were applied pre-emergence at both Hoytville and Columbus; CDEA, CDEC, and CDAA at 3, 6, and 9 lb/A; tris-(2,4-dichlorophenoxyethyl) phosphite (3Y9), Alanap 3, and compounds 551E and 552I at 2, 4, and 6 lb/A; CIPC at 4, 8, and 16 lb/A; a mixture of CIPC and Alanap 3, each at 2, 4, and 8 lb/A; compounds 5518, 5522 and 5523 (carbamates from Niagara Chem. Co.) at 8 and 16 lb/A; 2-chloro-4,6-bis (diethylemino)-s-triazine (Geigy 444E) at 6, 12 and 18 lb/A; and Premerge (DNBP) at 3, 5, 7 and 10 lb/A (Hoytville) and 2, 4, and 8 lb/A (Columbus).

Alkanolamine salts of 2,4-D were applied post-emergence at 1/8 lb/A (Hoytville, 4-leaf stage) and 1/8 and 1/4 lb/A (Columbus, 6-8 leaf stage). Treatments at Hoytville only: PGBE and isopropyl esters of 2,4-D pre-emergence

at 1 1/2 lb/A and DNBP at 3, 5, 7, and 10 lb/A and PCP in diesel oil at 8 and 12 lb/A applied when the soybeans were emerging.

The herbicides that were the most satisfactory were Alanap 3, Alanap 3 plus CIPC and DNBP. Alanap 3 and Alanap 3 plus CIPC caused no injury to soybeans at Hoytville at any rate, but at Columbus rates above 2 lb/A of each injured soybeans materially. PCP and Geigy 444E gave excellent weed control but were very injurious to the soybeans. 3Y9 gave good weed control; at Columbus the injury to the soybeans was extensive, while at Hoytville it was slight. CIPC was very injurious to the soybeans at the high rate; the weed control was good. 2,4-D pre-emergence gave good control of broadleaves without injury to the soybeans. Compounds 5518, 5522 and 5523 gave fair control of grasses but no control of broadleaves; 5523 was the most effective. 2,4-D post-emergence (4 to 8 leaf stage) was ineffective at the rates used; however, there was noticeable injury to the soybeans. CDAA, CDEA, CDEC, 551E and 552I were generally ineffective. The most effective of these was CDAA. (Ohio Agricultural Experiment Station)

Herbicides applied pre-emergence on soybeans. Freeman, J. F. and Horton, M. B. Wabash soybeans were drilled in 35-inch rows with a grain drill, and at the same time a mixture of rape and millet (equal parts) was sown broadcast through the grass-seed box. A light drag hitched behind the drill covered the seed and smoothed the soil. The soil was Burgin silty clay loam located on the Experiment Station Farm, Lexington.

Plots were planted June 1 and sprayed June 3 and 4. Soybeans began emerging June 6. Showers beginning June 6 continued almost daily through June 14 and amounted to 1.75 inches. A randomized complete block design with 4 replications was used. Plots were 4 rows wide and 30 feet long with a 16-foot section harvested for yield from each of the two middle rows. Weeds other than the rape and millet were not troublesome. After final notes were taken on July 6, the plots were clean-cultivated and weeds removed from rows to avoid undue competition which might obscure direct effects of the herbicide on yield of soybeans.

Herbicide treatments were DNBP alkanolamine salts at 6, 8, and 10 lb/A; CIPC at 6, 8, and 10 lb/A; N-1-naphthyl phthalamic acid (Alanap 1) at 1.8, 3.6, and 5.4 lb/A; polypropylene glycol butyl ether (PGBE) ester of 2,4-D at 1.5 and 2 lb acid/A; PGBE ester of 2 (2, 4, 5-trichlorophenoxy)-propionic acid (Kuron) at 1, 2, and 3 lb/A; sodium trichlorophenoxy ethyl sulfate (Natrin) at 1.6, 3.2, and 4.8 lb/A; sodium 2, 2, 3-trichloropropionate (EH 6249) at 3.2, 4.8, and 6.4 lb/A; and CMU at 0.8, 1.6, and 3.2 lb/A. Each material was applied in water spray at the rate of 29 gal/A with an experimental sprayer.

Results shown are based upon ratings of crop injury and weed control (rape for broadleaves and millet for grasses) made July 6 and in earlier observations, together with crop yield and stand at harvest. Vigorous growth of weeds on plots, where not controlled, apparently had affected crop yield potential prior to their removal a month after emergence; e.g., yield of unsprayed check was 28 bu/A, and of plots receiving treatments which controlled weeds with little crop injury, 33 to 35 bu/A. The latter figure is used as a standard yield for comparison instead of the check yield.

DNBP controlled broadleaves almost completely at 6, 8, and 10 lb. and grasses 85% at 10 lb. and 75% at 6 lb. Excellent yields were obtained at 10 lb. as well as at the lower rates, though some early injury occurred and stand was reduced 20% at the highest rate and 6% at the lowest. CIPC injured the crop severely even at 6 lb., reduced both stand and yield 30%, and gave almost complete control of weeds. At 10 lb. soybean stand and yield each was reduced 60%. Alanap 1 at all rates caused slight early injury and no reduction in stand, but reduced yields 25 to 30% at the two higher rates and 10% at the lowest rate. Control of broadleaves was about 60% and grasses 80% at the highest rate and considerably poorer at the lower rates.

2,4-D at 1.5 lb/A controlled broadleaves 65% and grasses 40% with 10% reduction in yield and no loss of stand, though considerable early injury was apparent. At 2 lb. yield was reduced 30%, though weed control was improved slightly. Kuron at 2 lb. controlled broadleaves 80% and grasses 40% with no reduction in yield, though stand was reduced 20% and early injury was apparent. At 3 lb. the crop was severely injured, and yield reduced 30% and stand 50%. At 1 lb. neither stand nor yield was appreciably affected, and control of weeds was 65% for broadleaves and 35% for grasses.

Natrin at 4.8 lb. gave 65% control of weeds with a slight reduction in yield, though considerable early injury reduced stand 10%. Weed control was inadequate at the two lower rates. EH 6249 had little effect on weeds or beans except for slight growth effects on bean plants at the highest rate used. CMU at all rates gave nearly complete control of weeds, but at the two higher rates it destroyed the stand of beans. At 0.8 lb. early injury retarded growth and reduced stand 36% and yield 30%. (Kentucky Agricultural Experiment Station)

Post-emergence treatments for weed control in soybeans. Hart, R. D., Rogers, B. J., and Gries, G. A. At the time of expansion of the third trifoliolate leaf of soybeans--June 20, 1955--several chemicals were applied in order to control a heavy infestation of barnyard grass (*Echinochloa crusgalli*) in the soybeans: alpha-chloro-N,N-diallylacetamide and 2-chloroallyldiethyldithiocarbamate at 2, 4, and 8 lb/A and 2-chloro-4,6-bis-(diethylamino)-s-triazine at 12 lb/A in 30 gal. of water/A. The soil was a Chalmers silty clay loam located in an area just north of Lafayette, Indiana. There was no significant rain for 4 days before and 12 days after the application. Maximum temperatures during this period ranged from 75° to 90° F.

The acetamide at 2 and 4 lb. caused marginal burning of soybean leaves and no to very slight contact injury to the grass. The dithiocarbamate at all rates caused some contact injury to soybeans, grass, and volunteer corn. The acetamide at 8 lb. severely burned all vegetation (including *Setaria* ssp., *Ambrosia artemisiifolia*) except ground cherry (*Physalis heterophylla*). The triazine at 12 lb. also burned all vegetation on the plots. (Department of Botany and Plant Pathology, Purdue University Agricultural Experiment Station)

Seedbed preparation for soybeans. Robinson, R. G., Jordan, L. S. and Dunham, R. S. Fall plowing, spring plowing, and surface tillage of corn stalk ground were compared as seedbed preparation for soybeans. Weed control and soybean yields were determined on (1) beans planted in 40 in. rows, (2) beans sown with a grain drill in 6 in. rows, and (3) beans sown with a grain drill plus a rye companion crop. The surface tillage consisted of cultivation with a field cultivator. All plots were disked and harrowed to make a good seedbed.

Results: Weed control was best on spring plowing and poorest on surface-tilled plots. Yields were highest on fall plowing and lowest on surface tillage regardless of method of planting. (Department of Agronomy and Plant Genetics, University of Minnesota; Paper No. 3442, Sci. Jour. Series, Minnesota Agricultural Experiment Station)

Pre-emergence treatments for weed control in soybeans. Rogers, B. J., and Hart, R. D. On May 26, 1955, N-1-naphthyl phthalamic acid, sodium salt, at 4 and 8 lb/A, IPC at 4 and 8 lb/A, 2-chloro-4, 6-bis-(diethylamino)-s-triazine at 3, 6, and 12 lb/A, and 2-chloroallyl diethyldithiocarbamate and alpha-chloro-N, N-diallylacetamide at 2, 4, 6, 8, and 10 lb/A in 30 gal. of water/A were applied just prior to emergence of the soybeans. Soil was a Chalmers silty clay loam located in an area just north of Lafayette, Indiana. During the week before application, over 2 in. of rain fell; in the week after, over 1 in. The maximum temperatures ranged from 58° to 84° F.

The area used had an exceedingly heavy infestation of barnyard grass (Echinochloa crusgalli), with small numbers of Setaria ssp., Physalis heterophylla, and Ambrosia artemisiifolia. The best over-all weed control was shown by the NP sodium salt at 8 lb., but at this rate, and to a lesser extent at the 4 lb. rate, there was severe stunting of the soybeans. The acetamide at 4, 6, 8, and 10 lb. and the dithiocarbamate at 8 and 10 lb. showed excellent grass control which persisted for 4 to 5 weeks. At the 8 and 10 lb. rates, some injury to the soybeans appeared about a week after emergence. Broadleaf weeds were not controlled. Neither IPC nor triazine gave adequate control at the rates used. Triazine at 12 lb. injured the soybeans. (Department of Botany and Plant Pathology, Purdue University Agricultural Experiment Station)

Pre-emergence herbicides on soybeans. Sand, P. F. Soybeans were planted at Lincoln, Nebraska, on June 2, 1955, on a Crete-Sharpsburg complex, a soil with medium to rapid surface drainage and medium to slow internal drainage. The plots were 16 feet long and 3 rows wide. Two of the rows in each plot were treated, leaving one row in each plot as a check to compare with the treated area. The treatments applied were CIPC at 4, 6, and 8 lb/A; DNBP sodium salt at 4 and 6 lb/A; NP sodium salt at 4, 6, and 8 lb/A; 2 chloro-4,6-bis-(diethyl amino)-s-triazine at 4, 8, and 12 lb/A; a-chloro-N,N-diallyl-acetamide (CDEA) and 2-chloroallyldiethyldithio-carbamate (CDEC) at 2, 4, and 8 lb/A.

The plots were treated on June 3, 1955. The soil surface was dry at the time of treatment, but 1.34 inches of moisture fell on June 4 and ample moisture was received throughout June to promote good growth of soybeans and weeds. Weed control notes were taken on June 30 by estimating the percent of kill. The most prevalent weed in the plots was crabgrass, with some pigweed.

Chemicals that gave satisfactory weed control were CIPC at 6 and 8 lb/A, which gave 79 and 76 percent control of weeds; NP sodium salt at 4, 6, and 8 lb/A, 79, 88, and 95 percent; a-chloro-bis(diethylamino)-s-triazine at 12 lb/A, 82 percent; CDEA at 8 lb/A, 82 percent; and CDAA at 4 and 8 lb/A, 91 and 98 percent. (Department of Agronomy, College of Agriculture, Lincoln, Nebraska)

Post-emergence sprays for soybeans. Slife, F. W., Gantz, R. L., Williams, M. C. Hawkeye soybeans were treated on June 16 with several new compounds specifically for annual grasses. The soybean plants had the first trifoliate leaf half expanded and the second trifoliate visible but not expanded. Soybean

plants were approximately 4 inches tall. Chemicals used were CDAA, CDEC, and CDEA, all at 4 and 6 lb. of acid per A. Within 24 hours the soybean plants began to show symptoms of leaf burning, and after 48 hours the leaf burning was severe at the 6 lb. rate for all chemicals and moderately severe at the 4 lb. rate. Annual grasses were controlled well at all rates of all chemicals. Grass weeds had developed to the 1- to 4-leaf stage at time of treatment. Broadleaf weeds were also controlled well in this test. Although the beans were slightly retarded by these treatments, they recovered rapidly and yields were not reduced by any of the rates of any chemical. (Department of Agronomy, Illinois Agricultural Experiment Station)

Pre-emergence herbicides for soybeans. Slife, F. W., Williams, M. C., Gantz, R. L. Hawkeye soybeans were planted on May 25 in a black silt loam with good soil moisture. A randomized block design with 4 replications was laid out, and pre-emergence chemicals were applied immediately after planting. Chemicals used were CDEA at 3, 5, and 7, CDAA at 3, 5, and 7 lb. of acid per A; CDEC at 3, 5, and 7 lb/A; DNBP at 6, 8, and 10 lb/A; Alanap 3 at 4, 6, and 8 lb/A; CIPC at 6, 8, and 10 lb/A; 3Y9 Tris-(2,4-dichloro-phenoxyethyl) phosphite at 4, 6, and 8 lb/A. Rain fell soon after the chemicals had been applied, giving ideal conditions for pre-emergence weed control.

CDEA, CDAA, and CDEC gave outstanding control of grass without injuring the soybeans. At equal rates, CDAA was slightly superior to the other two chemicals. All of these chemicals suppressed broadleaf weeds but did not adequately control them. DNBP gave excellent broadleaf control at all 3 rates but controlled grasses only at the 10 lb. rate. At the 8 and 10 lb. rates of DNBP, soybeans were stunted and stand was reduced by 20%. The soybeans later recovered from this injury. Alanap 3 gave 95% control of both broadleaf and grass weeds at the 6 lb. rate and 100% control at the 8 and 10 lb. rates. At all rates there was some soybean stunting, and at the 8 and 10 lb. rates some loss of stand. CIPC gave good control of grass and broadleaf weeds at 6 lb. and complete control at 8 and 10 lb. Soybeans were stunted and reduced in stand at both the 8 and 10 lb. rates. At all rates 3Y9 controlled weeds better than any of the other chemicals. Although at the rates tested it caused severe injury to the soybeans, its use at lighter rates should be investigated. (Department of Agronomy, Illinois Agricultural Experiment Station)

Forage Legumes

Paul F. Sand

Summary

Fourteen abstracts were submitted on forage legumes. Post emergence applications of the phenoxybutyric acids look promising for control of broadleaf weeds in birdsfoot trefoil, alfalfa, and red clover. They are reported by one investigator to be the least toxic of any materials tested on alfalfa including 2,4-dichlorophenoxypropionic acid, MCPP, 2,4-D and MCP.

Dalapon is reported to have successfully controlled downy brome (Bromus tectorum in an established stand of alfalfa at rates of 2, 4 and 6 lb/A. Slight dwarfing of the alfalfa was noted in one experiment from the 4 and 6 lb/A rates.

A difference in response to Dalapon of varieties of Ladino Clover was observed. Two varieties were not affected by the 2 lb/A rate of Dalapon while the stand of another variety was reduced 25 percent at this rate.

Dalapon at 2 to 4 lb/A and TCA at 5 to 8 lb/A have for the most part given good control of weedy grasses in seedling stands of birdsfoot trefoil, alfalfa and sweet clover with little or no injury. Where injury has been reported by these chemicals on these three legumes, it has been mostly a temporary stunting with slight reductions in stand reported at the higher rates. One investigator reported a slight reduction in stand of these three legumes when they were treated at a height of 2 to 4 inches, however, when treated at 6 to 12 inches tall no injury was noted. One experiment shows that the stand of birdsfoot trefoil was increased considerably in a seedling establishment study by controlling crabgrass with Dalapon and TCA.

Seedling stands of alsike clover and red clover withstood treatment with MCP ester, MCP amine and 2,4-D amine at 2 and 4 oz. per acre with no apparent injury. Alfalfa and sweet clover were affected by the treatment, however, the sweet clover was affected more by 4 oz/A of MCP ester and 2,4-D amine than was alfalfa.

Abstracts

Effect of 2,4-D and MCP on seedling stands of alfalfa and sweet clover - 1955. Brown, D. A. Wheat was used as companion crop. Stands of both legumes were particularly good at time of spraying. Treatments: 2,4-D LV 4 ester; 2,4-D standard butyl ester, and MCP ester, all at 2 and 4 oz/A; 2,4-D and MCP amine at 3 and 5 oz/A, and MCP sodium salt at 4 and 6 oz/A. Treatments were applied at two stages of growth (1) legumes 1 1/2 inches high (2) 4-5 inches high. Final ratings, stand of legumes in per cent of untreated plots October 12, 1955. Alfalfa-formulation. 2,4-D LV 4 ester 41%; 2,4-D standard butyl ester 44; 2,4-D amine 78; MCP ester 65; MCP amine 75, and MCP sodium salt 74. Rates of application percentage stand, low rates 67%; high rates 58. Stages of growth early seedling 73% stand; late seedling 52%. Sweet Clover.- formulations, 2,4-D LV 4 ester 73% stand; standard butyl ester 79; 2,4-D amine 92; MCP ester 88; MCP amine 91 and MCP sodium salt 90. Rates low 84%; higher rates 86%. Stages of growth, -early 87% stand later stage 85%. Discussion. This experiment completed its sixth year. In four of the previous five years, sweet clover was generally more readily injured by treatments than alfalfa. The reverse occurred in 1955. Treatments were done simultaneously the sprayer transferring from alfalfa to clover with the same solution in the tank for each rate and date. The pattern in alfalfa followed that of previous years, formulations grading in severity from least to greatest as follows: 2,4-D amine; MCP amine; MCP sodium salt; MCP ester;

2,4-D standard ester, and 2,4-D LV ester. It has been proved that alfalfa is least sensitive at the early seedling stage. Sweet clover showed remarkable resistance to the chemicals in 1955. In degree of injury the formulations followed the exact pattern of alfalfa. Differing from alfalfa, sweet clover is less sensitive at the later seedling stage. Weed Control: The crop was moderately infested with lambsquarters, red root pigweed, stinkweed, shepherds purse, grey tansy mustard, Russian thistle, wild buckwheat and thyme leaved spurge. In over-all control formulations and rates graded as follows in per cent control; 2,4-D LV 4, 4 oz/A 78; 2 oz/A 73; 2,4-D butyl ester 4 oz/A 76; 2 oz/A 70. MCP ester 4 oz. 72; 2 oz. 63; MCP amine 5 oz. 70; 3 oz. 65. MCP sod. salt 6 oz. 72; 4 oz. 60. 2,4-D amine 5 oz. 63; 3 oz. 56. (Contributed by Experimental Farm, Brandon, Manitoba.)

Toxicity of chlorinated phenoxy-acetic, -butyric and -propionic acids in established alfalfa. Buchholtz, K. P., and Lord, L. C. Plots in a one-year-old-stand of Ranger alfalfa were treated with 2,4-D (2,4-dichlorophenoxyacetic acid), 2,4-DP (2,4-dichlorophenoxypropionic acid), 2,4-DB (2,4-dichlorophenoxybutyric acid), MCP (2-methyl, 4-chlorophenoxyacetic acid), MCPP (2-methyl, 4-chlorophenoxyacetic acid), MCPB (2-methyl, 4-chlorophenoxybutyric acid), and 3,4-D (3,4-dichlorophenoxyacetic acid) when the alfalfa was from 7 to 8 inches in height. The amine preparations of the chemicals were used. Applications were made on May 25, 1955, at the rates of 0.25, 0.5, and 1.0 lb/A using water equal to 20 gal/A. Plots were 6 by 12 feet in size and three replications were used. The alfalfa was harvested in the early bloom stage on June 14.

Material	Alfalfa yields (lbs/A) on plots receiving various rates 0.25	0.50	1.0	Ave.
2,4-D	730	302	334	456
2,4-DP	3142	1662	504	1769
2,4-DB	3460	3448	3259	3389
3,4-D	3134	1847	1730	2237
MCP	633	222	24	293
MCPP	2270	1347	403	1340
MCPB	3509	3053	2545	3036
Check		4190		

LSD at 1 pct. level between ave. yields - 198.

2,4-D and MCP caused severe damage to the alfalfa even with the lowest rate applied. The propionic acids were less toxic than the acetic with 2,4-DP being less toxic than MCPP. The butyric acids were the least toxic of any of the materials tested. 2,4-D DB appeared to be noticeably less toxic than MCPB at the higher rates of application. 3,4-D was less toxic than 2,4-D, MCP, 2,4-DP, and MCPP but considerably more toxic than the butyric acids. (Contribution of the Agronomy Department, University of Wisconsin, Madison, Wisconsin. Supported in part by the Quebec Agricultural Research Council.)

Control of crabgrass in alfalfa with herbicides. Elder, W. C. Replicated plots 20' x 20' were located in an old established alfalfa field. Chemicals were applied June 2 immediately after the second cutting of hay. The field was heavily infested with well established crabgrass due to excessive rains after the first cutting. The following treatments were made: 5 lb/A Dalapon, 8 lb/A TCA, 2 qt Dinitro plus 20 gal diesel oil/A, and 2 lb/A 3-(3-4-Dichlorophenyl) -1.1-dimethylurea. The plots were cut 30 days later and the grass and alfalfa separated. Check plots produced 1,000 lb/A dry alfalfa hay and 1,700 lb/A dry grass. TCA plots yielded 1,364 lb/A hay, and 836 lb/A grass. 1,666 lb/A of hay and 34 lb/A grass was harvested from the Dalapon plots. These rates may be prohibitive for the production

of one crop of hay, but are promising where a seed crop is harvested. The other two chemicals were not promising in this test. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma.)

Effect of herbicides on spring planted legumes. Elder, W. C. The following legumes were planted April 15, 1955: Korean lespedeza, sericea lespedeza, two strains of sweet clover, three strains of alfalfa, hairy vetch, rose clover, white clover and birdsfoot trefoil. Chemicals were applied in 40 gal water/A. The first treatment was on May 16 when the plants were 2 to 4 inches high and the second treatment was on June 9 after the legumes were 6 inches to one foot high. Herbicides used were 8 lb/A TCA, 4 lb/A Dalapon, 1/2 lb/A amine 2,4-D, and 1 lb/A 3-(3-4-dichlorophenyl)-1.1-dimethylurea. More than 90% of the legumes were killed by the amine 2,4-D and urea compound, with the exception that very little Korean clover was injured by the second treatment with 2,4-D. Dalapon and TCA controlled annual grasses. Alfalfa, sweet clover and birdsfoot trefoil survived the second treatment of Dalapon and TCA in good shape. The first treatment killed some of the plants and checked the growth of the others for a short period of time. The other legumes in the test were severely injured by Dalapon and TCA. (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma.)

Effect of MCP and 2,4-D on the forage yield of four species of legumes. Friesen, H. A. and D. R. Walker. MCP ester, MCP amine and 2,4-D amine were each applied at dosages of 2 and 4 oz/A to strips of each of alfalfa, alsike, red and sweet clover. The legumes were sown in 6 inch drill rows in June 1954 and the herbicides applied while they were the seedling stage in late July. Observations in September of 1954 showed a very marked suppression of growth in each species but actual loss of plants was apparent only in sweet clover sprayed at 4 oz/A with the 2,4-D amine and the MCP ester. As shown in the table, the number of plants and tons of dry matter produced per acre of either alsike or red clover was not materially affected by any of the treatments. The number of alfalfa plants was somewhat depressed by each of the MCP ester and the 2,4-D amine at 4 oz/A; however, the tonnage of dry matter produced was not notably depressed. Sweet clover suffered some loss of stand as the result of each treatment and where the MCP ester and 2,4-D amine were used at 4 oz/A this loss exceeded 50 per cent. A closely similar trend was noted on the amount of dry matter produced following these treatments.

Treatment	Alsike	Alfalfa	Sweet Clover	Red Clover	Alsike	Alfalfa	Sweet Clover	Red Clover
2,4-D amine 4 oz/A	.82	.97	1.00	1.47	666	329	111	2158
Check	.89	1.02	1.55	1.21	685	537	395	2571
2,4-D amine 2 oz/A	1.07	.93	1.41	1.39	628	537	290	2249
MCP ester 4 oz/A	1.07	.93	1.33	.99	683	445	175	2514
Check	1.16	.99	1.89	1.17	685	537	395	2571
MCP ester 2 oz/A	1.16	.97	1.46	1.10	706	594	347	2243
MCP amine 4 oz/A	1.02	1.00	1.40	1.36	809	542	281	2408
Check	1.26	1.15	1.67	1.28	685	537	395	2571
MCP amine 2 oz/A	1.26	1.13	1.39	1.53	642	509	284	2410

(Contributed by the Experimental Farm, Lacombe, Alberta.)

Weed control of MCPB on weeds in alfalfa. Hay, J. R. MCPB, 2-methyl, 4-chlorophenoxybutyric acid, was applied to alfalfa undersown in oats at 4, 6 and 8 oz per acre in June 1955. There was little or no serious injury to alfalfa, control of lambsquarters and pigweed was good, but ragweed was unaffected by the chemical. According to present concepts then alfalfa does not convert MCPB to MCP but neither can ragweed so that both are resistant. (Central Experiment Farm, Ottawa.)

Control of downy bromegrass (Bromus tectorum) in alfalfa. Keyser, H. R. Quadruplicate plots were established in a 4th year alfalfa field heavily infested with downy bromegrass (Bromus tectorum). The field was sprayed April 14, 1955 with Dalapon (Sodium salt of 2,2-dichloropropionic acid) at 4 and 6 lb/A and Na TCA at 5 and 7 lb/A. The downy bromegrass was from 2-6" (leaves fully extended) and the alfalfa was 2-3" tall. Only .62" of rain was received the month following application. RESULTS: Dalapon at 4 and 6 lb/A gave 84 and 95% control respectively; Na TCA at 5 and 7 lb/A gave 16 and 45% control respectively. Neither of the chemicals injured the alfalfa or reduced the stand. (Contribution of Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska, and University of Nebraska Experiment Station, North Platte, Nebraska.)

Weed control in seedling birdsfoot trefoil. Kerr, Harold D. and Dayton L. Klingman. Birdsfoot trefoil planted in a randomized split block experiment April 4 received initial basic treatments on May 19 when 3 to 5 inches tall, of either Dalapon at 3 pounds per acre, TCA at 8 pounds per acre, or no treatment (check). Weeds and their height in inches at the time of treatment were: smartweed 12, pigweed 12, giant foxtail 7, and crabgrass 3. Supplemental treatments were superimposed on the initial basic treatments on May 28, June 18, and July 23 as indicated in the table.

Percentage crabgrass and birdsfoot trefoil (other species omitted).

Supplemental Treatments*			Basic Treatment Applied May 19					
			3# Dalapon		8# TCA		Check	
May 28	June 18	July 23	Grass (%)	Trefoil (%)	Grass (%)	Trefoil (%)	Grass (%)	Trefoil (%)
M	D	M	0.3	32	11	31	51	14
None	M + D	M	3	24	12	24	12	18
None	M + TCA	M	2	15	41	9	48	3
M	M	D	27	13	81	1	82	1
M	M	M	40	9	90	1	89	1
None	M	None	60	7	79	1	76	2
None	M	M	64	5	86	1	85	2

* M = mowed, D = 3# dalapon, and TCA = 12# TCA; all plots were mowed Aug. 15.

Mowing was essential for control of broad-leaved weeds, and in mowed plots trefoil stands were directly related to crabgrass control. Best stands of trefoil resulted in plots sprayed early supplemented later with mowing for broad-leaved weed control and treatment with dalapon for weedy grass control. Mowing, or mowing plus a late spraying of dalapon, resulted in poor stands. (Contribution of the Field Crops Research Branch, A.R.S., U. S. Department of Agriculture, and the Missouri Agricultural Experiment Station cooperating.)

An evaluation of several new phenoxybutyric acids as post-emergence sprays for weed control in birdsfoot trefoil. Klingman, Dayton L. and Harold D. Kerr. Amine salt formulations of 4-(2,4-dichlorophenoxy) butyric acid [4(2,4,DB)], 4-(2-methyl,-4-chlorophenoxy)butyric acid [4-(MCPB)] at 1/2, 1, and 2 pounds acid equivalent per acre were compared to an amine salt of 2,4-D at 1/4, 1/2 and 1 pound acid equivalent

per acre as post-emergence sprays for the control of weeds in birdsfoot trefoil which had been seeded in the spring of 1955. The applications were made on July 7, 1955. This preliminary study indicated that the 4-(2,4-DB) and 4-(2,4,5-TB) may have promise for post-emergence weed control in birdsfoot trefoil. The 4-(MCPB) appeared to give somewhat more injury to birdsfoot than either of the others. The sodium salt of 4-(MCPB) was slightly less injurious than the amine salt. The 1/2 pound rates of 4-(2,4-DB) and 4-(2,4,5-TB) gave good control of Diodia sp., Croton sp., and lambsquarters with little injury to the birdsfoot trefoil. The 1 pound rates gave slight injury to birdsfoot trefoil, and were slightly more effective on the harder-to-kill weeds. 4-(2,4,5-TB) eliminated volunteer lespedeza at all rates, and had considerable effect on horse-nettle at the higher rates. Birdsfoot trefoil also tolerated 2,4-D amine at 1/4 pound per acre with only moderate to slight injury. (Contribution of the Field Crops Research Branch, A.R.S., U. S. Department of Agriculture, and the Missouri Agricultural Experiment Station cooperating).

Control of downy brome grass in alfalfa with Dalapon. Lee, O. C. Replicated plots located in an alfalfa field heavily infested with downy brome grass (*Bromus tectorum*) were sprayed with Dalapon using rates of 3, 6 and 9 lbs/A equal to 2.04, 4.08 and 6.12 lbs. of acid respectively in 30 gals. of water. Treatments were made on October 27, 1954. Observations were made in June of 1955 just prior to first cutting of hay. The 6 and 9 lb. rates prevented the growth of all downy brome grass. A slight dwarfing of the alfalfa was noted. The 3 lb. rate did not effect the growth of the alfalfa and destroyed all but a trace of the downy brome grass. Rates of 3, 6 and 9 lbs/A of Dalapon applied on March 16, 1955 gave equally good control of downy brome grass but caused more dwarfing of the alfalfa. The two heaviest rates reduced the height of the alfalfa approximately 6 inches as compared to checks. Note - A few green alfalfa shoots had developed my March 16 following a period of 65 to 70°F temperatures. (Contribution of Department of Botany and Plant Pathology, Purdue University Agricultural Experiment Station, Lafayette, Indiana.)

Control of grass weeds in spring seeded alfalfa. McCarty, M. K. and Sand, P.F. Alfalfa was seeded on April 16, 1955 and treated at three stages of development with six chemicals. Seeding rate was 10 lbs. per acre with an additional 10 per cent of weed seed which was predominantly green and yellow foxtail. Chemicals used were: TCA at 5 and 7 lbs. per acre, 2,2 dichloropropionic acid (dalapon) at 1, 2 and 4 lbs. per acre, 2,2,3 trichloropropionic acid at 1, 2 and 4 lbs. per acre and alpha-chloro-N,N-diallylacetamide (CDAA), alpha-chloro-N,N-diethylacetamide (CDEA), and 2 chloroallyl diethyldithiocarbamate (CDEC) at 4 lbs. per acre. At the first treatment stage (emergence) the alfalfa varied from cotyledon to first trifoliolate leaf stage of development with the grasses showing two leaves and about one inch tall. One week later (1 week after emergence) the alfalfa averaged two leaves, grass was 1/2 to 2 inches tall and smartweed and pigweed were 1 to 2 inches tall. At the four weeks after emergence, treatment, alfalfa was 3 to 4 inches tall, grasses were 2 to 6 inches tall with some of the foxtail beginning to show seed heads and smartweed and pigweed 4 to 6 inches tall. Stand counts were made on June 29 to July 2 in 5 eight square foot quadrats per plot of alfalfa stems, grass and broad-leaved weed plants. Quadrat clippings were made from July 5 to 12 and the harvested material hand separated into the three above catagories, oven-dried and computed to a lbs. per acre basis.

Results. TCA at 5 and 7 lbs. per acre, dalapon and 2,2,3 trichloropropionic acid at 2 and 4 lbs. per acre, all gave control of the weedy grasses at the two earlier stages varying from very good to excellent. Dalapon at 1 lb. per acre one week after emergence gave good reduction of the foxtails although a few scattered plants still made seed. Scattered plants of barnyard grass showed less susceptibility to the chemicals with little or no effect shown at the 1 lb. rates. CDAA, CDEA and CDEC

at 4 lbs. per acre showed little effect on the grass weeds but a slight reduction in alfalfa stand. TCA, dalapon and 2,2,3 trichloropropionic acid at the highest rates gave slight to moderate stunting of the alfalfa with the 4 lb. rate of dalapon apparently reducing the stand to a slight extent. The following table gives the yields of the grassy weeds as determined by clipping studies.

Yield of weedy grasses as affected by weed control treatments at three stages of development. Average of four replications.

Pounds per acre of oven-dry material harvested in July.

Treatment	Rate lb/acre	Emergence	1 week after Emergence	4 weeks after Emergence	Average
TCA	5	126	192	423	247**
	7	45	42	735	274**
Dalapon	1	471	288	840	533**
	2	96	48	522	222**
	4	102	8	486	199**
2,2,3 trichloro-	1	954	654	921	843**
propionic acid	2	435	375	936	582**
	4	447	105	570	374**
CDAA	4	714	945	1059	906*
CDEA	4	594	1011	1641	1082
Check		1191	1422	1374	1329
AVERAGE		470	462	864	

S.E. of mean difference for treatment = 150.

* Difference from check exceeds .05 level of significance.

** Difference from check exceeds .01 level of significance.

(Contribution of Field Crops Research Branch, ARS, and Agronomy Department, College of Agriculture, and the Nebraska Agricultural Experiment Station cooperating.)

The effect of several chemicals on seedling alfalfa and birdsfoot trefoil. Slife, F. W. Alfalfa and birdsfoot trefoil were seeded on April 5 in separate blocks without a nurse crop. Chemicals were applied as pre-emergence and post-emergence treatments. Chemicals and rates used in lbs of acid per acre as pre-emergence were TCA 4 and 8 lbs, Dalapon 2 and 4 lbs, 6249 (trichloropropionic acid) 2 and 4 lbs, CDAA (alpha-chloro-diallyl-acetamide) 2 and 4 lbs, and CDEC (Dichloro-allyl diethyldithiocarbamate) 2 and 4 lbs. Post-emergence treatments were applied when the alfalfa and birdsfoot trefoil seedlings were 1 to 2 inches and 5 to 6 inches tall. Chemicals and rates used in lbs of acid per acre were: TCA 4 and 8 lbs, Dalapon 2 and 4 lbs, and 6249 2 and 4 lbs. Grass weeds were controlled well by the pre-emergence treatments. TCA at 8 lbs, Dalapon at 4 lbs, 6249 at 4 lbs, CDAA at 4 lbs, and CDEC at 4 lbs all gave comparable results. Birdsfoot trefoil seedlings were not affected by any of the chemicals at any of the rates used as pre-emergence treatments. Alfalfa seedlings were slightly retarded at the 8 lb/A rate of TCA and the 4 lb/A rate of Dalapon, but outgrew the injury. Dalapon at the 4 lb/A rate was the most effective treatment on grass weeds of the post-emergence herbicides. Complete control of several annual species was obtained. Birdsfoot trefoil seedlings were not affected at either treatment date by any of the chemicals. Alfalfa seedlings were retarded by the heavy rate of Dalapon and TCA, but later recovered. Hay yields have been taken from the birdsfoot trefoil plots but have not been calculated. (Contributed by the Department of Agronomy, Illinois Agricultural Exp. Station.)

MCPB and 2,4-DB on alfalfa and red clover. Willard, C. J. and Rhykerd, C.L. Samples of 4-chloro-2-methylphenoxy-butyric acid and 2-4-dichlorophenoxy butyric acid were kindly furnished us by the National Research Development Corporation of London, England. They were applied at 1 and 2 pounds per acre (active ingredient) to new seedings of alfalfa and red clover, 4 to 6 inches high, and birdsfoot trefoil seed-

lings 2 to 4 inches high. Neither chemical injured red clover at either rate. 2,4-DB did not injure alfalfa at either rate, but MCPB injured alfalfa slightly at the 2-pound rate. Birdsfoot was under a considerable canopy of weeds, but appeared to be slightly more injured than either alfalfa or red clover. The tops of Canada thistle, field bindweed, lambsquarter, and curled dock growing in the clover were killed. Climbing milkweed (Ampelamus albidus) and rough pigweed were somewhat injured but not killed by either chemical at the rates used. Black nightshade (Solanum nigrum), and nodding spurge (Euphorbia maculata), were not at all injured by either chemical at the rates used. Knotweed (Polygonum aviculare) was somewhat injured but not killed by both chemicals. (Contribution of the Ohio Agricultural Experiment Station.)

Effect of Dalapon, Karmex DL and Karmex DW on new seedings of Ladino Clover and Birdsfoot Trefoil. Wilsie C. P. and Bakke, A. L. Seedings of Ladino clover and birdsfoot trefoil seeded April 14 were sprayed on May 18 and 19 with Dalapon, Karmex DL and Karmex DW at rates of one and two pounds per acre. There was a good stand of Ladino clover where one lb. of Dalapon had been used, but with 2 lbs of Dalapon there was a reduction in stand of approximately 25 per cent. Two varieties, Iowa Synthetic 1972 and a California strain 306, apparently were not affected at the 2 lb rate. This indicated that varieties differ in their resistance to Dalapon. The control of grasses was only fair. Karmex DW at one and two pound rates killed both the weeds and the Ladino clover so that the ground was practically bare.

Where seedling plots of birdsfoot trefoil had been sprayed with 2 lbs of Dalapon per acre, there was a good stand of trefoil and good weed control. Two lbs. of Karmex DL caused about 20 per cent damage to the trefoil. With one lb. there was a fair stand of the legume but poor weed control. With Karmex DW at the rate of 1 lb per acre there was a fairly good stand of trefoil, but at 2 lbs. there was a stand reduction of 25 per cent. With Karmex DL applied at the 2 lb. rate, the upright varieties Viking Cascade and Granger appeared to be more resistant than Empire. In some plots of Empire the damage was as much as 50 per cent. Of the three herbicides, Dalapon gave the best results in controlling weeds in seedling stands of both Ladino clover and birdsfoot trefoil. There appears to be varietal resistance. MCP controlled the broad-leaf weeds like Pennsylvania smart weed and goosefoot. (Iowa Agricultural Experiment Station.)

HERBACEOUS WEEDS IN PASTURES AND MEADOWS

M. K. McCarty

Summary

Two abstracts were received, one on weed control and the second on pasture renovation. Hairy chess was controlled with no damage to the warm season grasses with 3 and 4 pounds of CMU or PDU per acre. Dalapon at rates high enough to control the hairy chess seriously damaged the warm season grasses. Dalapon, amizol and combinations of the two were used to prepare a saltgrass meadow for seeding with tall wheatgrass and alfalfa. Dalapon at 40 lb./A. gave 90% control but other treatments were less effective.

Abstracts of Contributors

Control of hairy chess (Bromus commutatus) in a warm season grass pasture. McCarty, M. K., and Sand, Paul F. Plots 10 x 20 feet were established in a warm season grass pasture seeded in 1952. Three replications were used. A mixture of switchgrass (Panicum virgatum), side-oats- grama (Bouteloua curtipendula) and sand lovegrass (Eragrostis trichodes) had been heavily infested with hairy chess. A dense stand of hairy chess seedlings covered the plot area by Oct. 1. The following chemicals were applied on Oct. 21 when the seedlings were 1 1/2 - 2 inches high: 2,2 dichloropropionic acid (Dalapon) at 1, 2, 3 and 4 lbs. per acre, 3-(p-chlorophenyl)-1,1-dimethylurea (CMU) at 3 and 4 lbs. per acre and 3-(phenyl)-1,1-dimethylurea (PDU) at 3 and 4 lbs. per acre. Each plot was divided into three portions with the North 1/3 receiving the above treatments, the central portion no treatment and the South 1/3 receiving the above treatments on April 21 when the hairy chess plants were about 2 inches tall. The following table gives the reaction to the treatments for the control of hairy chess and damage to the warm season grass mixture.

		% Hairy chess control		% Reduction of Warm Season Grass	
Treatment	Rate	Fall	Spring	Fall	Spring
Dalapon	1	15	15	0	0
	2	70	70	40	40
	3	85	90	95	75
	4	85	100	95	90
CMU	3	90	95	0	0
	4	95	95	0	0
PDU	3	90	90	0	0
	4	90	95	0	0

Although little difference in degree of control was shown between fall and spring treatments, a very striking difference was observed in the vigor of the warm season grass. In the untreated areas the warm season grasses made very little spring or summer growth as most of the available soil moisture and nitrates were depleted by the hairy chess. Where fall treatments had reduced the hairy chess with no damage to the warm season grasses, a very luxuriant growth followed as all the winter and early spring moisture was conserved and plant nutrients were available to the desirable grasses at their maximum period of growth. The spring treatments showed an intermediate response because the hairy chess had continued to use moisture and nutrients through the fall and early spring until time of treatment. (Contribution of the Field Crops Research Branch, ARS, Dept. of Agron., College of Agriculture, and the Nebraska Agricultural Experiment Station, Cooperating.)

The use of grass herbicides as an aid in pasture establishment. Keyser, H. R. and Ehlers, P. E. Quadruplicate plots of a predominately saltgrass (Distichlis stricta) meadow with some big bluestem (Andropogon gerardi), switchgrass (Panicum virgatum), western wheatgrass (Agropyron smithii), and Kentucky bluegrass (Poa pratensis) were sprayed May 23, 1955 with Dalapon (Sodium salt of 2,2-dichloropropionic acid) at 10, 20, and 40 lb./A; Amizol (3-amino-1,2,4-triazole) at 5, 10, and 20 lb./A; Amizol at 5 lb./A. plus Dalapon at 10 lb./A; and Amizol at 10 lb./A. plus Dalapon at 10 lb./A. The saltgrass was 3" tall at the time of treatment and there was no tillage either prior to or after spraying. Estimates of the per cent control of the saltgrass were taken August 8, 1955. On September 27, 1955 the experimental area was seeded with tall wheatgrass and alfalfa. RESULTS: Dalapon at 10, 20, and 40 lb./A. gave 55, 76, and 90% control; Amizol at 5, 10, and 20 lb./A. gave 11, 11, and 18% control; Amizol at 5 lb./A. plus Dalapon at 10 lb./A. gave 65% control; Amizol at 10 lb./A. plus Dalapon at 10 lb./A. gave 65% control. Amizol at 5, 10, and 20 lb./A. appeared to be quite effective two weeks after treatment but by August the saltgrass on these plots had almost completely recovered. (Contribution of University of Nebraska Experiment Station, North Platte, Nebraska and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska.)

SUGAR BEETS

Summary

Robert N. Andersen

Five abstracts were received for inclusion in this section. Five others entered in the section on All Annual, Winter Annual and Biennial Weeds were also reviewed. The abstracts of the North Dakota work deal only with weed free beets. The materials used were also applied to wild oats and Setaria in separate tests, the results of which are presented in the Annual Weed section.

Twenty five different chemicals applied to beets were reported this season. The large number of materials tested makes it impossible to discuss each in this summary. Although some of the data are conflicting it appears that some of the 25 materials used this year can be dropped from further tests because of severe beet damage and/or ineffective weed control.

TCA, Dalapon, and 2,2,3-trichloropropionate were reported in all five abstracts presented in this section. In general all three chemicals appeared to be effective on Setaria sp. with beets showing tolerance. Dalapon was effective in controlling emerged wild oats.

The results with CDAA and CDEA ranged from excellent weed control with no beet injury to poor control except at rates that were injurious to beets. It seems apparent that CDAA was more active than was CDEA.

DCU (2 reports) applied as a pre-planting soil treatment gave good control of Setaria sp. with beets showing tolerance.

Abstracts

Pre-emergence applications of herbicides to weed free sugar beets. Andersen, Robert N. and Helgeson, E. A. Beets were planted in Fargo clay soil on May 16, 1955. Individual plots consisted of 4 treated rows 24 ft. long. An untreated buffer row was left between plots. Rows were 20 inches apart and beets were blocked to 18 inches apart in the row with wheel hoes. Beets were hand thinned and were kept free of weeds for the entire season by wheel hoeing and hand weeding as needed. On May 24 the materials shown in the table below were applied in 20 gal aqueous solution/A. At this time beets were just starting to emerge. Two-tenths of an inch of rain fell the day before treatment and a total of 1.47 inches fell in four days immediately following treatment. On September 15, yields were determined from a total of 42 ft of row harvested from the 2 center rows in all plots. Sugar analyses were made by the American Crystal Sugar Co. These data summarized below are from a randomized block design with three replications.

Treatment (lb acid equiv/A		Yield (T/A)	Sugar (%)	
				L.S.D. (yield)
Check		12.37	14.72	(.05)= 1.05 T
Sodium 2,2-dichloropropionate	2	12.06	15.32*	(.01)= 1.46 T
" "	4	11.90	14.45	
" "	6	12.37	14.53	
Sodium 2,2,3-trichloropropionate	2	12.16	14.63	L.S.D. (sugar)
" "	4	12.73	14.77	(.05) = .45%
" "	6	13.30	14.58	(.01) = .62%
Sodium trichloroacetate	6	11.67	14.87	

None of the treatments caused a statistically significant reduction in yield or sugar. (Field Crops Research Branch, A.R.S., U.S. Dept. of Agriculture and North Dakota Agr. Exp. Sta., Fargo, N.D.).

Post-emergence applications of herbicides to weed free sugar beets. Andersen, Robert N. and Helgeson, E. A. Beets were planted in Fargo clay soil on May 16, 1955. Individual plots consisted of 4 treated rows 24 ft long. An untreated buffer row was left between plots. Rows were 20 inches apart and beets were blocked to 18 inches apart in the row with wheel hoes. Beets were hand thinned and were kept free of weeds for the entire season by wheel hoeing and hand weeding as needed. The materials shown in the table below were applied in 20 gal aqueous solution/A. On September 15, yields were determined from a total of 42 ft of row harvested from the 2 center rows in all plots. Sugar analyses were made by the American Crystal Sugar Co. These data summarized below are from a split plot design with three replications.

Treatment 1/	Cotyledonary to 4 true leaf stage June 13		Six to 10 true leaf stage June 25	
	Yield T/A	Sugar content %	Yield T/A	Sugar content %
Check	13.25	13.72	13.04	14.13
Dalapon 2 lb/A	11.25**	13.57	12.86	13.77
Dalapon 4 lb/A	11.87	13.47	11.54*	13.93
Dalapon 6 lb/A	9.90**	14.00	11.38*	14.02
E.H. 6249 2 lb/A	12.55	13.88	12.68	14.53
E.H. 6249 4 lb/A	11.80*	14.23	12.13	13.43
E.H. 6249 6 lb/A	10.76**	14.68	11.77	13.92
TCA 6 lb/A	11.90	13.90	11.90	13.53
CDEA 3 lb/A	12.50	14.88*	13.64	14.30
CDEA 6 lb/A	12.21	14.30	10.47**	14.20
CDAA 3 lb/A	11.80*	14.48	11.56*	13.93
CDAA 6 lb/A	10.65**	14.30	10.47**	14.52
LSD (.01) - - - - - - - -	1.9 T	1.51%	1.9 T	1.51%

1/ Rates of first three herbicides are in terms of acid equivalent, last two in terms of active material. Dalapon, E.H. 6249, and TCA are the sodium salts of 2, 2-dichloropropionic; 2,2,3-trichloropropionic; and trichloroacetic acids respectively. CDEA is alpha-chloro-N,N-diethylacetamide. CDAA is alpha-chloro-N,N-diallylacetamide.

It is apparent that the chemical treatments caused yield reductions in these weed free beets. Whether or not these reductions would be more than compensated for by the benefits of weed control needs yet to be determined. It is believed that the apparent greater reduction from 2 lb of dalapon as compared to 4 lb of dalapon (column 1) is due only to chance. (Fields Crops Research Branch, A.R.S., U.S. Dept. of Agriculture and North Dakota Agr. Exp. Sta., Fargo, N.D.).

Pre-emergence weed control in sugar beets. Keyser, H. R. Quadruplicate 6-row plots 16 feet long were sprayed just prior to emergence of sugar beets which were planted April 21, 1955. The following treatments were applied May 3, 1955 in 80 gallons of aqueous solution per acre: Geigy 444E (2-chloro-4,6-bis-(diethylamino)-s-triazine) at 2, 4, 6, and 8 lb/A; Dalapon (Sodium dichloropropionate) at 2, 4, 6, and 8 lb/A; TCA sodium salt at 5, 7½, and 10 lb/A; Sodium 2,2,3-trichloro-

propionate at 2, 4, 6, and 8 lb/A; HC-1281-S (Sodium trichlorobenzoate) at ½, 1, 2, and 4 lb/A; TCA sodium salt at 5 lb/A plus Amizol (3-amino-1,2,4-triazole) at 2 lb/A; TCA sodium salt at 5 lb/A plus Amizol at 4 lb/A. The soil surface was dry at the time of application and some green foxtail (Setaria viridis) had emerged. No rain was received for two weeks following chemical application. The weed population consisted mainly of green foxtail. RESULTS: Dalapon at 2, 4, 6, and 8 lb/A gave 49, 70, 71 and 89 per cent control respectively; Sodium 2,2,3-trichloropropionate at 2, 4, 6, and 8 lb/A gave 55, 65, 69, and 75 per cent control; TCA sodium salt at 5, 7½, and 10 lb/A gave 68, 71 and 76 per cent control. These three chemicals stunted the sugar beets slightly but the beets recovered and outgrew the damage. Geigy 444E, HC-1281-S, and TCA sodium salt plus Amizol all severely reduced the stand of sugar beets. Geigy 444E was the most severe followed by HC-1281-S and TCA sodium salt plus Amizol. (Contribution of the University of Nebraska Experiment Station, North Platte, Nebraska; and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska).

Herbicides on sugar beets. Miller, O. C. and Willard, C. J. At the Northwest Substation, O.A.E.S., Hoytville, Ohio, beets were planted May 6 in rows 2½ feet apart with rape and millet to simulate weeds. Herbicides were applied to triplicated plots of 4 rows, 25 feet long. All rates following are of active ingredient per acre. All herbicides were applied in 40 gallons spray per acre. There was a check plot adjacent to each treated plot. The following were applied pre-planting and disked into the soil May 6; DCU at 5, 10 and 15 lb. and IPC at 2, 4, and 8 lb. The following were applied pre-emergence May 9 and May 16; dalapon and sodium 2,2,3-trichloropropionate, EH6249, at 1½, 3, 4½ and 6 lb/A; TCA, sodium salt, at 5, 7½ and 10 lb/A; alpha chloro-N,N-diethylacetamide (CDEA), Alpha chloro-N,N-diallylacetamide (CDAA), 2-chloro-diethyldithiocarbamate (CDEC) and 4 (chloroacetyl) morphaline at 3, 6 and 9 lb.; 3Y9 (tris-(2-dichloro-phenoxy-ethyl) phosphite), compounds 55IE, and 552I at 2, 4 and 6 lb/A; and Compounds 5522, 5523 (carbamates from Niagara Chem. Co.) at 8 and 16 lb/A. The following were applied May 20 just as the beets were emerging; dalapon at 1½, 3, 4½ and 6 lb.; EH6249 at 1½, 3 and 4½ lb.; sodium TCA at 2, 4, 6 and 8 lb.; and PCP in diesel oil at 5 and 10 lb. The following were applied May 26 (2 leaf); dalapon and EH6249 at 3 and 6 lb. and sodium TCA at 4 and 8 lb. Sodium 2,3,6-trichlorobenzoate (HC 1281 S) was applied May 31 (4 leaves) at ½, 1½, 4 and 8 lb/A.

DCU gave excellent control of grass but no control of broadleaves. IPC was ineffective at rates applied and under these conditions. Pre-emergence TCA, dalapon, and EH6249 gave excellent grass control. EH6249 was the least effective. CDEA and CDAA were effective only on grasses and at the high rates. CDAA gave the best control. CDEC, 4(chloroacetyl) morpholine and compounds 55IE and 552I were ineffective. 3Y9 gave good control of grasses and fair control of broadleaves. It caused some burning of the leaves of beets but this was later outgrown. Compounds 5522 and 5523 gave satisfactory control of grasses with 5523 giving the better control. On May 20 and May 26, Dalapon, sodium TCA, and EH6249 gave excellent control of grasses. Again EH6249 was least effective. PCP and HC 1281 S gave excellent weed control but were highly toxic to the beets, especially HC 1281 S. Because of drouthy conditions and a rough, cloddy seedbed, germination of the beets was so poor that it was difficult to rate the herbicides and the ratings are subject to a considerable margin of error. (Contribution of the Ohio Agricultural Experiment Station.)

Evaluation of herbicides for weed control in sugar beets - 1955. Nelson, Russell T. In one test in which pre-emergence applications at 4, 8 and 16 lb/a were made with each of the following CDAA (alpha-chloro - N, N - diallylacetamide) CDEA (alpha-chloro - N, N -diethylacetamide) CDEC (2-chloroallyl diethyldithio-

carbamate) there was little weed control except at the 16 lb/a rate. However, at the high rate both beets and weeds were injured. In this group the order of herbidical activity from high to low was rated CDAA, CDEA, CDEC.

In a second test in which sugar beets in the cotyledon stage were sprayed at rates of 4, 8 and 16 lb/a with T-516 [Isopropyl N-3-(methylphenyl) carbamate], T-517 [sec. - Butyl N- (3-chloro-phenyl) carbamate] and Giegy 444 E [2-chloro-4, 6 bis-(diethyl-amino) - triazine] little weed control was obtained except with Giegy 444 E. The latter gave marked control of broadleaf seedlings (beets and weeds) at 4 lb/a and near complete control at 8 and 16 lb/a. Grass was not controlled.

Endothal at 3 to 6 lb/a as a pre-plant or pre-emergence treatment gave outstanding control of both grass and broadleaf weeds with no visible injury to sugar beets.

TCA, Dalapon and Sodium 2,2,3 - trichloropropionate all gave good grass control with little injury to sugar beets and other broadleaf plants.

DCU in field demonstration plots at 4 to 8 lb/a applied as a pre-planting soil treatment gave good grass control with no visible retardation in growth of sugar beets. Grass in fields was nearly all Setaria. (Contribution of the Great Western Sugar Company, Agr. Experiment Station, Longmont, Colorado.)

TURF

Summary Oliver C. Lee

Abstracts submitted indicate that many herbicidal materials will give some degree of control of crabgrass. It appears that repeated applications of even the most promising materials are necessary to produce a satisfactory kill. The varied results obtained, particularly with disodium methyl arsonate, indicate that factors affecting plant growth, such as moisture and temperature, determine results as to the degree of crabgrass kill and injury to desirable turf grasses. Pre-emergence applications of herbicides appear promising, when applied at frequent intervals.

A sticker added to 2,4-D and other auxin-like compounds increased their efficiency in controlling henbit. Of the several materials applied, ammonium sulphate was most promising for the control of common chickweed.

Methyl bromide applied at the rate of 1 pound per 100 square feet will destroy all vegetation and kill weed seeds that are in the soil.

Abstracts

Turf renovation using odorized methyl bromide under a gastight cover. Davidson, J.H. An undisturbed weedy lawn turf area in southwestern Michigan was fumigated with odorized methyl bromide at the rate of one pound per 100 sq. ft. Fumigation was made September 2, 1954. Exposure period was 24 hours. Air temperature during fumigation varied between 62° and 70° F. Soil temperature was 67° F. Complete fertilizer, analysis 12-12-12, was applied at the rate of 25 pounds per 1000 sq. ft. Merion bluegrass at the rate of 1 lb. on 750 sq. ft. was seeded on the undisturbed dead turf one day after the cover was removed. Seed was washed off dead vegetation and brought in contact with soil by heavy sprinkling. A good turf requiring mowing was obtained by October 20. Weeds present in the turf prior to fumigation were: crabgrass (*Digitaria ischaemum*), nutgrass (*Cyperus esculentus*), broadleaved plantain (*Plantago major*), buckhorn plantain (*Plantago lanceolata*), dandelion (*Taraxacum officinale*), common chickweed (*Stellaria media*) and common mouse-ear chickweed (*Cerastium vulgatum*). Observations made during the 1955 growing season indicated complete kill of all the above weeds and their seeds in the treated area. An excellent stand of pure Merion bluegrass was obtained, the only weed present being white clover. (The Dow Chemical Company, South Haven, Michigan).

Pre-emergence control of crabgrass in lawns. Hogard, T.W. and Hemphill, D.D. Following chemicals were applied to randomized replicated plots in a Kentucky Bluegrass lawn for pre-emergence crabgrass control (*Digitaria sanguinalis*): NP (Alanap 1F), 18 lbs per 1000 sq ft, one treatment; Alanap 1F, 36 lbs per 1000 sq ft, one treatment; Alanap 1F, 18 lbs per 1000 sq ft, three applications, 4 weeks apart; Natrin, 4 lbs per acre; SES, 4 lbs per acre; DCU, 10 lbs per acre; Dupont Crabgrass Killer #1, 4 lbs per acre; and disodium methyl arsonate, 3.7 oz per 1000 sq ft. Point Quadrat readings were taken 7 weeks after first treatments and control as indicated by per cent of turf foliage consisting of crabgrass in the various plots was as follows: Alanap 1F, one 18 lb treatment, 4.2%; Alanap 1F, one 36 lb treatment, 11.9%; Alanap 1F, 3 18 lb treatments, 3.8%; Natrin, 15.6%; SES, 9.9%; DCU, 11.5%; Dupont Crabgrass Killer #1, 18%; disodium methyl arsonate, 20% and Control - 18%. Bluegrass in Alanap 1F treated

plots exhibited a darker green color throughout the season. Crabgrass was controlled throughout the season in plots receiving three applications of Alanap 1F. With all chemicals tested, 2 or 3 applications at approximately four week intervals will be necessary for crabgrass throughout the season. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

Post-emergence control of crabgrass in lawns. Hogard, T.W. and Hemphill, D.D. Following chemicals were applied to randomized, replicated plots of Kentucky Bluegrass for the control of crabgrass (Digitaria sanguinalis) in various stages of growth:

2 to 3 leaf stage - Standard Crabgrass Spray; 80 gal per acre, 2 applications 10 days apart; Scutl (.74 per cent PMAS), 1.25 lbs per 400 sq ft, 2 applications 7 days apart and 4 applications 7 days apart; disodium methyl arsonate 3.7 oz per 1000 sq ft, 2 applications 7 days apart and 3 applications 7 days apart and Alanap 1F, 18 lbs per 1000 sq ft, one treatment. Using Point Quadrat method of sampling final readings were taken 10 weeks after first treatment. Per cent of turf foliage consisting of crabgrass in various plots was as follows: Standard Crabgrass Spray, 73%; Scutl, 2 treatments - 73%; 4 treatments - 56%; disodium methyl arsonate, 2 treatments - 15%; 3 treatments - 9.5%; Alanap 1F - 78%; Control - 77%. Disodium methyl arsonate did not control stink grass (Eragrostis cilianensis) and plots became infested with it.

1/2 mature crabgrass - (10 weeks after germination) --
Chemicals used: Disodium methyl arsonate, 3.7 oz per 1000 sq ft, one treatment; Scutl, 2.5 lbs per 400 sq ft, 2 treatments 10 days apart; PC dust #1 15 lbs/1000 sq ft, one treatment; PC dust #3, 15 lbs/1000 sq ft, one treatment; disodium methyl arsonate, 3.7 oz per 1000 sq ft, 2 treatments 10 days apart; KOCN, 5.8 oz per 1000 sq ft, one treatment. Readings taken 10 weeks after first treatment indicated the following per cent control of crabgrass: Disodium methyl arsonate, one treatment - 62%, 2 treatments - 100%; Scutl, PC dusts #1 and #3, and KOCN gave no control. Disodium methyl arsonate and the various potassium cyanate treatments caused temporary discoloration of the bluegrass. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

Spring control of henbit in lawns. Hogard, T.W. and Hemphill, D.D. For the control of henbit (Lamium amplexicaule) in the early bloom stage the following chemicals were applied to randomized replicated plots: 2,4-D, 3 lbs per acre; MCP, 3 lbs per acre; TCB (2,3,6-trichlorobenzoic acid), 4 lbs per acre; 2,4,5-T, 3 lbs per acre; ammonium sulfate, 1 lb per 100 sq ft. Control was as follows: 2,4-D, 30%; MCP, negligible; TCB, 45%; 2,4,5-T, 35%; ammonium sulfate, 50%. These chemicals were applied without a sticker-spreader. Above treatments, except ammonium sulfate were applied to another series of plots on April 1, with 1% National Sticker added. Results were: 2,4-D, 60% control; MCP, 65%; TCB, 80% and 2,4,5-T, 75%. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

Spring control of chickweed in lawns. Hogard, T.W. and Hemphill, D.D. Following chemicals were applied on March 5 to randomized, replicated plots of Kentucky Bluegrass lawn containing common chickweed (Stellaria media): 2,4-D, 2 lbs per acre; MCP, 2 lbs per acre; ammonium sulfate, 2 lbs per 100 sq ft; CIPC, 3 lbs per acre; KOCN, 16 lbs plus CIPC, 3 lbs per acre. Control was as follows: 2,4-D, 50%; CIPC, 40%; KOCN plus CIPC, 50%; MCP only slowed growth

for 3 weeks. Ammonium sulfate gave 93% kill with some burning of bluegrass. All evidence of burning disappeared in 4 weeks and later growth was better than check plots. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

Bermuda grass eradication in lawns. Hogard, T.W. and Hemphill, D.D. For the eradication of common Bermuda grass in lawns the following chemicals were applied July 30, 1955 to randomized, replicated plots: Methyl bromide (Dowfume MC-2), 1 lb per 100 sq ft; Sodium 2,2,3-trichloropropionate, 20 lbs per acre; Disodium methyl arsonate, 50 lbs per acre; Dalapon (2,2-dichloropropionic acid), 10 lbs per acre; Amino triazole, 10 lbs per acre; Dalapon, 5 lbs plus Amino triazole, 5 lbs per acre; Vapam (sodium N-methyl dithiocarbamate dihydrate), 1 qt per 100 sq ft. Results were tabulated September 9 with the following estimated control: Methyl bromide - 100%, sodium 2,2,3-trichloropropionate - 0%, Disodium methyl arsonate - 0%, Dalapon - 75%, Dalapon plus Amino triazole - 83%, Vapam - 72%. Diggings in treated area showed that regrowth in Vapam plots came from deep roots which indicates that the Vapam was not soaked into the soil sufficiently deep. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

Response of crabgrass in bluegrass turf to organic arsonates. Hart, R.D., Rogers, B.J. and Lee, O.C. Plots of Kentucky bluegrass (Poa pratensis) infested with crabgrass (Digitaria sanguinalis), regularly watered and mowed to 1½ inches, were used for this test. Treatments consisted of two and three applications at five-day intervals of disodium methyl arsonate at 3 and 5 lbs/A and disodium benzyl arsonate at 7, 9, and 11 lbs/A of actual material. All were applied as sprays with 30 gal of water/A. Spray dates were August 19, 24, and 29. The crabgrass was in a late vegetative stage of growth at the time of treatments. Observations were made on September 5. Two applications at 11 lbs and three applications at 9 and 11 lbs of the benzyl arsonate, and two and three applications at 5 lbs of the methyl arsonate caused moderate to severe discoloration of the bluegrass, primarily a tip burn. Discoloration from other treatments was slight to moderate. Final evaluation was made on September 30. No discoloration was noted from any treatment. Both 3 and 5 lb rates of the methyl arsonate applied two and three times gave 80% control. Both 9 and 11 lb rates of the benzyl arsonate applied two and three times gave approximately 50% control. Treatments made earlier on a golf course fairway as a whole did not give satisfactory control. Successive applications on June 22, 29, and July 26 of the benzyl arsonate at rates of 7 and 11 lbs/A gave approximately 60% control of the crabgrass without permanent injury to the bluegrass. Varying rates applied during June and July indicated very little difference in tolerance of bluegrass and crabgrass to these materials. The greatest degree of injury occurred when sprays were applied during high temperatures. (Contribution by the Department of Botany and Plant Pathology, Purdue University, Agricultural Experiment Station).

Crabgrass control in bluegrass turf with Chlordane. Hart, R.D., Rogers, B.J. and Lee, O.C. Three formulations of Chlordane - 75% emulsifiable, 25% granular, and 5% dust - were applied to two replications on a golf course fairway at rates of 20, 40, 60, 80 and 100 lbs/A of actual Chlordane; two formulations, 75% emulsifiable, and 5% dust were applied to four replications on rough (area just off the fairway) at rates of 20, 40 and 80 lbs/A. The fairway area was mowed regularly to 1½ inches and consisted chiefly of Kentucky bluegrass (Poa pratensis) and crabgrass (Digitaria sanguinalis); the rough was mowed to 4 inches and consisted of at least 50% Kentucky bluegrass, with

red fescue (Festuca rubra) and crabgrass (Digitaria ischaemum) making up the largest percentage of the remaining grass cover. The emulsifiable formulation was applied as a spray in 120 gals/A; the two other formulations were applied dry. Treatments were made with the emulsion on April 2 (pre-emergence), April 21 (emergence), and June 8 (mid-vegetative); granular on April 23, and June 8; and dust on May 2, and June 8. Crabgrass emergence began on April 20. No injury to the established turf was noted in any of the treatments. Visual estimates of the control of crabgrass were made on August 1. The emulsion applied to the rough at 80 lbs reduced the crabgrass stand by 80, 80 and 74%, respectively, for the three dates of treatment. On the fairway the emulsion at 60, 80 and 100 lbs reduced the stand by 65, 85 and 85%, respectively, when applied April 2, and 50, 80 and 90% when applied on June 8. The granular material applied on April 23, at 80 and 100 lbs, gave 90% control. A 50% reduction in crabgrass was obtained with the dust on the fairway when applied at 100 lbs on May 2. (Contribution by the Department of Botany and Plant Pathology, Purdue University, Agricultural Experiment Station).

Crabgrass control in bluegrass turf. Nylund, R.F. and R.J. Stadtherr. In 1955, thirteen herbicides were applied to bluegrass turf at U. Farm to quadruplicated plots, each 100 sq. ft. in area. The following acre rates of seven pre-emergence treatments were applied on June 10: 10 lb. dichloral urea, 4 lb. dichlorophenyl methyl butyl urea, 6 lb. chloro diethyl acetamide (CDEA), 8 lb. SES, 784 lb. alanap-1F, 4 lb. 2,4 dichlorophenoxy ethyl phosphite (3Y9) and 8 lb. 2,4 dichlorophenoxy ethyl benzoate (sesin). The latter four herbicides were applied again to the same plots on July 1 and July 22. The following four herbicides were applied three times (June 24, July 1, and July 8) as post-emergence treatments: 653 lb. Milcyanate (4% KOCN + 96% Milorganite), 8 lb. potassium cyanate (plus 1 lb. wetting agent), 8 lb. disodium methyl arsonate, and 4.5 gal. of 2½ percent PMAS. Two herbicides were applied when crabgrass was in the boot stage (July 22 and again August 5): 108 gal. Standard Crabgrass Killer, and 108 gal. Standard Spray C. Both of these are refined petroleum oils, the latter containing chlordane. All liquid herbicides, except the oils, were applied in 100 gal. water per acre at 30 psi pressure. Ratings of injury to crabgrass and bluegrass (scale: 0= no injury; 5= complete kill) were made on July 8, July 22, and August 23. Approximately one month after the first pre-emergence application, alanap 1F, 3Y9, sesin, and the dichlorophenyl urea all showed fairly good crabgrass control (3.0-3.8) without serious injury to the bluegrass (0.2-1.2). SES and dichloral urea were somewhat less effective in crabgrass control (2.2 + 2.5) and CDEA gave no control. By August 23, one month after the third application only sesin of the pre-emergence treatments showed much crabgrass control (2.5), but bluegrass injury with this treatment was moderately severe (2.2). Two weeks after the last application of the post-emergence herbicides, PMAS had given complete control of crabgrass (5.0) and disodium methyl arsonate about complete control (4.8), but both severely injured the bluegrass (3.0 and 3.5). Potassium cyanate and Standard Spray C. gave fairly good control (3.5 and 3.8), but the latter caused somewhat more temporary discoloration of the bluegrass. Bluegrass in plots treated with alanap 1F, PMAS, Standard Crabgrass Killer, and Standard Spray C was considerably more vigorous on September 23 than that in other plots. The poor fall development of bluegrass in other plots was due either to excessive competition by crabgrass (e.g. untreated and CDEA) or residual injury by the herbicide (e.g. disodium methyl arsonate) or both. (Paper No. 3432 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station).

Post-emergence control of crabgrass. Davis, R.R. An unirrigated bluegrass sod was treated with disodium methylarsonate, 8 lbs/A; 3,4-Dimethylbenzophenone, 4 and 6 lbs/A; and PMA (dry), 1 lb/A. Each material was applied at the above rates on June 25, July 5, and July 11. Spray applications at 100 gals./A were made except for PMA. Disodium methylarsonate gave excellent control of crabgrass but there was permanent injury to small areas of bentgrass in the sod in addition to discoloration of the entire sod. Neither of the other materials gave consistent satisfactory control of crabgrass. In another test, disodium methylarsonate; 8 lbs/A; PMA (dry), 1 lb/A; and KOCN, 8 lbs/A were applied July 26, August 1, and August 8 on a bluegrass sod. Method of application was the same as described above. Complete control of crabgrass was obtained with disodium methylarsonate but with serious injury to bluegrass. Both PMA and KOCN gave partial control with PMA giving better control in this test. (Ohio Agricultural Experiment Station, Wooster, Ohio).

Pre-emergence control of crabgrass. Davis, R.R. An unirrigated bluegrass sod was treated with 5-(3-4 dichlorophenyl)-1-methyl-1-n-butylurea, 4 lbs/A and dichloral urea 6.3 lbs/A. Each material was applied at the above rate May 12 and June 20. Spray applications were made at the rate of 100 gals/A. 5-(3-4 dichlorophenyl)-1-methyl-1-n-butylurea gave excellent control of crabgrass with no apparent injury to the sod. Dichloral urea did not give satisfactory control. (Ohio Agricultural Experiment Station, Wooster, Ohio).

Field and Canning Peas

Summary J. J. Sexsmith

A total of seven abstracts was received, three of which are entered below and the others are to be found in the section on Annual Weeds.

Pre-seeding treatments - Without causing excessive injury to peas, IPC 6 and 8 lb, CIPC 6 and 8 lb, 5518 (isopropyl methylphenyl carbamate) 8 lb, CDAA (chloro diallyl acetamide) 3 and 6 lb, and CDEA (chloro diethyl acetamide) 6 lb/A gave good to excellent control of wild oats; and CIPC 8 lb/A gave good control of green foxtail.

Pre-emergence treatments - While causing only slight or no injury to peas, 3,4-D 5 lb, DNBP (amine) 6 and 9 lb, Geigy #444 (chloro diethyl amino triazine) 8 lb, and CIPC 8 lb/A gave satisfactory control of broad-leaved annual weeds; CDAA and CDEA 6 lb/A gave reasonably good control of wild oats; and DNBP (amine) 9 lb, E.H. #3Y9 (2,4-dichlorophenoxy ethyl phosphite) 6 lb, CDEA 6 and 9 lb, CDEC (chloro allyl diethyl dithiocarbamate) 9 lb, and CIPC 8 lb/A gave fairly good control of *Setaria* spp.

Post-emergence treatments - MCP 0.3 lb, DNBP (amine) 1 and 1½ lb, a mixture of Dalapon 1 lb plus MCP 0.3 lb, and a mixture of Dalapon 1 lb plus DNBP (amine) 1 lb/A gave excellent control of broad-leaved annual weeds, and the two mixtures gave good control of *Setaria* spp., without causing serious injury to peas. The mixtures gave better weed control than any of the three components applied singly.

Increasing spray volume from 6 to 39 gal/A decreased injury to peas with the amines of both 2,4-D and MCP. 2,4-D was more injurious than MCP. 2,4-D and MCP appeared to give equal top-growth control of Canada thistle, and control was less at 39 gal than at 6, 12, or 22 gal/A.

Abstracts

A screening test of pre-emergence herbicides for canning peas. Nylund, R. E. Late peas of the Perfection type seeded on May 2 in a silty clay loam soil were sprayed just before emergence (May 10) with the following herbicides: 8 lb TCA (Na salt); 1 lb CMU; 3, 6, and 9 lb DNBP (amine); 1 lb 2,4-D (LV ester); 1, 2, and 3 lb MCP (amine); 1 lb dichlorophenyl dimethylurea (Karmex DW); 4 and 8 lb amino triazole; 4, 8, and 12 lb chloro diethylamino triazine (Geigy #444); 2, 4, and 6 lb dichlorophenoxy ethyl phosphite (E.H. #3Y9); 3, 6, and 9 lb chloro diallyl acetamide (CDAA); 3, 6, and 9 lb chloro diethyl acetamide (CDEA); 3, 6, and 9 lb chloroallyl diethyl dithiocarbamate (CDEC); 1 lb dichlorophenoxy propionic ethanol (ACP-L685); 8 lb sodium trichlorophenoxy ethyl sulphate (Natrin 80S); 4 and 8 lb CIPC; 4 and 8 lb isopropyl methylphenyl carbamate (N5518); 4 and 8 lb chloroethyl chlorophenyl carbamate (N5520); 4 and 8 lb chloropropyl methylphenyl carbamate

(N5522); 4 and 8 lb chloroethyl methylphenyl carbamate (N5523); and a mixture of 4 lb amino triazole plus 4 lb Dalapon. Each treatment was applied to duplicate plots one-half square rod in area at 30 psi in 40 gal water per acre. Weed control and injury to peas were estimated approximately one month after spraying.

Only 6 and 9 lb DNBP (amine), 8 lb Geigy #444, and 8 lb CIPC gave satisfactory control of broad-leaved weeds - 100%, 100%, 85%, and 75% respectively - without excessive injury to peas. The following herbicides gave 60-75% control of grasses without excessive pea injury: 9 lb DNBP (amine), 6 lb E.H. #3Y9, 6 and 9 lb CDEA, 9 lb CDEC, and 8 lb CIPC. (Paper No. 3431 of the Scientific Journal Series of the Minn. Agr. Exp. Sta., University Farm, St. Paul, Minn.)

Post-emergence weed control in late canning peas. Nylund, R. E. Late canning peas of the Perfection type seeded on silty clay loam soil on May 2 were sprayed at the 5-node stage on May 20 (grass weeds at 3-4 leaves) with the following herbicides: 0.2 and 0.3 lb MCP (amine); 0.2 and 0.3 lb 2,4,5-T (amine); 0.2 and 0.3 lb 2,4,5-T propionic (Silvex); 5 lb TCA (Na salt); 2 and 4 lb chlorodiethylamino triazine (Geigy #444); 1 and 1.5 lb DNBP-amine (Premerge); 1 lb Dalapon; 0.2 and 0.3 lb trichlorobenzoic acid (ACP-L857); and the mixtures 1 lb Dalapon plus 0.3 lb MCP, and 1 lb Dalapon plus 1 lb Premerge. All were applied at 30 psi in 40 gal water per acre to duplicated one-half square rod plots. Temperature was 82°F on the day of spraying. The principal weeds present were Setaria spp. Weed control and crop injury were estimated on June 6, seventeen days after spraying.

The following herbicides gave good broad-leaved weed control without serious crop plant injury: 0.3 lb MCP (75%); 1 and 1.5 lb Premerge (75%); and the two mixtures Dalapon plus MCP (100%), and Dalapon plus Premerge (100%). The Dalapon plus MCP mixture caused slight injury to the pea plants.

Dalapon at 1 lb, Dalapon plus MCP, and Dalapon plus Premerge were the only herbicides which gave good grass control (60-75%) without serious crop plant injury. Of these, the Dalapon-Premerge mixture was most effective and caused no crop injury. (Paper No. 3430 of the Scientific Journal Series of the Minn. Agr. Exp. Sta., University Farm, St. Paul, Minn.)

Effect on canning peas and weeds of amine 2,4-D and MCP applied at different rates and spray volumes. Sexsmith, J. J. The amines of 2,4-D and MCP were applied to Topper canning peas on July 14/55, forty-one days after seeding, at which time the patchy stand of peas was from 6 to 16 in. tall averaging about 12 in. Triplicate treatments of each chemical at rates of 0, 2, 4, and 8 oz/A were applied in water solutions at 6, 12, 22, and 39 gal/A. The plot area was infested with a thin stand of redroot pigweed and lamb's quarters, as well as a light and scattered stand of Canada thistle. Scoring for injury to the crop and control (not kill) of weeds was made three weeks after treatment. The crop stand was too poor to allow for taking of yield samples. Results: Crop injury in 1955 was more severe than in 1954, perhaps being due to the fact that in 1955 the crop was slightly more advanced when treatments were applied. 2,4-D caused more injury than did MCP at all comparable volumes and rates. Injury to the

crop decreased as the volume of spray application increased. Only slight injury to the crop resulted from 4 oz MCP at 12, 22, and 39 gal/A, from 8 oz MCP and 2 oz 2,4-D at 22 and 39 gal/A, and from 4 oz 2,4-D at 39 gal/A. MCP was equal to or only slightly inferior to 2,4-D at equal rates for control of the light infestation of mixed red-root pigweed and lamb's quarters. No difference in control was obtained at the 6, 12, and 22 gal/A volumes, but a slight decrease in control resulted from the 39 gal/A volume. For the control of Canada thistle, based on incomplete data because of the scattered infestation, it was concluded that MCP and 2,4-D gave the same degree of control for equal volume and rate treatments, and that control was less at 39 gal/A than at the 6, 12, or 22 gal/A volume. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.)

Vegetable "Root Crops"

E. K. Alban

Summary

Eight abstracts on onion, two on potatoes and one each on turnips and sweet potatoes were received on this group of crops.

Onions. All abstracts included results with CIPC used as a pre- and/or post-emergence spray. An 8.0 lb./A. rate was most frequently used as a delayed pre-emergence treatment with generally favorable weed control (stand counts) and also reduced costs of first hand-weeding. Post-emergence applications of CIPC ranged from 3.0 lbs./A. to 12.0 lbs./A rates with from one to three spray periods through the growing season. With the exception of some oil formulations at a 10.25 lbs./A. rate, used by one investigator, there were no statistically significant reductions in onion yields caused by post-emergence applications of CIPC at the "loop" stage, as directed basal sprays on more mature onions, as overall coverage sprays, or as lay-by sprays. Total season use of CIPC at a 30.0 lbs./A. rate did not result in reduction in onion yield.

CMU and bis (ethyl xanthic) disulfide also were reported as very satisfactory in pre- and/or post-emergence applications. Some of the more promising new materials include: CDAA (alpha-chloro-N, N-diallylacetamide); chlorodiethylamine triazine, (Geigy 444); chloroethyl chlorophenyl carbamate; and chloropropyl chlorophenyl carbamate.

Potatoes. In addition to the generally satisfactory weed control obtained with DNBP (alkanol-amino salts of dinitro o-sec-butylphenol) as pre-emergence sprays, the following chemicals appeared promising; CDAA, CDEA, CMU, and mixture of above with Dalapon and sodium TCA.

Sweet Potatoes. Control of Setaria spp. in sweet potatoes was accomplished with SES, Sesin, Natrin and NP (Alanap 50-W). SES provided best control but also caused injury to the sweet potatoes. The other three materials did not cause yield reduction. NP (Alanap-2) did not provide good grass control but sweet potato yields from these plots were greater than from check or other treated plots.

Turnips. This work reports primarily the damage to turnips from 2,4-D (amine salts) sprays as related to root size and discoloration of turnips. The discoloration (orange pigment) was reported to have involved cambium and phloem tissue in the 2,4-D treated turnips and preliminary analysis of the pigment indicated that it was carotene.

Abstracts

Onions

Chemical weed control on onions. Lana, E. P. and Staniforth, D. W. Post-emergence directional sprays of Chloro IPC on onions grown in muck soil were made at the 3-leaf stage (June 3) and subsequent 2-week periods. Before initial spraying all plots were made weed free. Two rates were applied 4 and 8 lb./A. The plots were set up so one set would receive 1 spray treatment, another set 2 sprays and the third three sprays. This would allow for concentrations from 4 lb. to 24 lb./A. There was no significant reduction in yield for any of the six treatment combinations. CIPC controlled purslane, the most prevalent weed, very well. Control varied with concentration of herbicide. At harvest, August 17, the plots receiving 12 to 24 pounds CIPC were practically clear of purslane. Residual effects of CIPC below 12 pounds did not give lasting weed control, and supplemental cultivation was necessary. (Horticulture and Botany and Plant Pathology Departments, Iowa State College, Ames, Iowa).

Effects of various combinations of CMU and CIPC on hand-weeding costs and on stands and yields of onions. Nylund, R. E. Brigham Yellow Globe onions seeded in muck soil on April 21 were sprayed with 1.6 lb. CMU or 8 lb. CIPC at pre-emergence (April 18), at the one-leaf stage (May 20), at the three-leaf stage (June 9), and at lay-by (July 19) in various combinations (e.g. CMU or CIPC pre-emergence followed by CMU or CIPC at the three-leaf stage; CMU or CIPC pre-emergence followed by CMU or CIPC at lay-by; CIPC at pre-emergence followed by CMU or CIPC at three-leaf and CMU or CIPC at lay-by, etc.). The herbicides were applied as complete coverage sprays at the first two stages and as basal sprays when applied at the three-leaf or lay-by stages. Each treatment was applied to single row plots, 14 feet long, replicated four times. Plots received normal cultivation. Hand-weedings made on May 25 and June 23 were timed with a stop watch to determine the effects of the herbicide applications on weeding costs. A third hand-weeding made July 7 was not timed. Weed stands shortly before harvest were estimated. Stands and yields of onions were obtained at harvest on August 30.

Application of either CMU or CIPC at pre-emergence treatments or at the one-leaf stage reduced labor costs of the first hand-weeding by approximately 44 percent. Application of either CMU or CIPC at the three-leaf stage did not reduce the labor requirement for the second hand-weeding. This was probably due to the extremely hot dry weather which inhibited weed germination even in the untreated plots. Shortly before harvest, very few broad-leaved weeds were present in plots which had received a lay-by application of either CMU or CIPC, more were present in plots which had been sprayed at the three-leaf stage, and those sprayed pre-emergence only or not at all were very weedy. Grasses were less affected by the herbicide applications. No significant differences in stands or yields of onions were obtained regardless whether onions were sprayed with one, two, or three applications of CMU or CIPC or combinations of these herbicides. (Paper No. 3428 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.).

The effects of CMU and CIPC on onions when applied at various stages of growth. Nylund, R. E. Brigham Yellow Globe onions seeded April 21 in muck soil were sprayed with 1.6 lb. CMU and 8 lb. CIPC at each of the following stages of growth: (1) Before germination (April 28), (2) late flag stage (May 12), (3) early two-leaf stage (May 27), (4) three-leaf stage (June 9), and (5) five-to-six leaf stage (June 23). The herbicides were applied as complete coverage sprays at the first three stages and as basal sprays at the last two stages. Sprays were applied at 35 psi. pressure in 80 gal. water per acre. Each treatment was applied to single row plots 14 feet long in four replicates. The experiment was a split plot design with the three herbicide treatments (control, CMU, and CIPC) randomized within the five stages of growth. All plots were kept hand-weeded to harvest on August 30.

Neither CMU nor CIPC significantly affected stands and yields of onions regardless of the stage of onion plant development at the time of application. (Paper No. 3427 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.).

The effectiveness of fourteen herbicides for pre-emergence, early post-emergence, and late post-emergence weed control in onions. Nylund, R. E. Brigham Yellow Globe onions seeded in muck soil on April 21 were sprayed with herbicides at each of three stages of growth: pre-emergence (seven days after seeding), early post-emergence (onions in one-leaf stage), and late post-emergence (lay-by stage). The following herbicides and rates were applied at 35 psi. pressure in 80 gal. water per acre: 1.6 lb. CMU, 4 and 8 lb. CIPC, 10 lb. xanthogen disulphide, 4 and 8 lb. chlorodiethylamine triazine (Geigy #444), 4 and 8 lb. 2,4-dichlorophenoxyethyl phosphite (E.H. #3Y9), 4 and 8 lb. isopropyl methylphenyl carbamate (N5518), 4 and 8 lb. butyl chlorophenyl carbamate (N5519), 4 and 8 lb. chloroethyl chlorophenyl carbamate (N5520), 4 and 8 lb. chloropropyl chlorophenyl carbamate (N5521), 4 and 8 lb. chloropropyl methylphenyl carbamate (N5522), 4 and 8 lb. chloroethyl methylphenyl carbamate (N5523), 3 and 6 lb. chlorodiallyl acetamide (CDAA), 3 and 6 lb. chlorodiethyl acetamide (CDEA), and 3 and 6 lb. chlorallyl diethyl dithiocarbamate (CDEC). No rain fell during the six days following any of the herbicide applications, and precipitation was below normal during the entire growing season. Weed control data were obtained approximately two weeks after herbicide application at each of the three stages. Weed counts were made after the pre-emergence application, but, because of extreme variability in weed stands in the plot area, weed control following the post-emergence applications was estimated using a scale of 1 to 5. Yield data were obtained at harvest on September 6.

Of the pre-emergence treatments (weeds few and in the cotyledon stage), only CIPC at 8 lbs. xanthogen disulphide, and Geigy #444 appeared to be effective in broad-leaved weed control. Of these Geigy #444 shows most promise. Only CDAA and CDEA at both rates gave effective grass control with the 6 lb. rate of CDAA giving the best control (97%). With the exception of 4 lb. of E.H. #3Y9, none of the treatments significantly reduced onion yields.

When applied to onions in the one-leaf stage when weeds were up to 3" tall, CMU, 8 lb. CIPC, Geigy #444, 8 lb. N5520, and 8 lb. N5521, all gave good broad-leaved weed control and fair grass control. None of these treatments affected onion yields. None of the other herbicides were effective at this stage.

When applied to onions at lay-by, a number of herbicides were effective in controlling the numerous purslane plants present. These were: CMU, 4 and 8 lb. CIPC, xanthogen disulphide, 4 and 8 lb. Geigy #444, 4 and 8 lb. E.H. #3Y9, 8 lb. N5519, 8 lb. N5520, and 8 lb. N5521. At this stage best grass control was obtained with CMU, CIPC, 8 lb. E.H. #3Y9, 8 lb. N5518, and 6 lb. CDAA. Of these herbicides, only 8 lb. CIPC and 8 lb. Geigy 444 significantly reduced onion yields. E.H. #3Y9 and N5520 tended to reduce yields. (Paper No. 3426 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station).

Effect of repeated applications of CIPC on the yield of onions. Warren, G. F. Super Bronze onions planted in muck soil on April 21 were all given a pre-emergence treatment of 8 lb./A. of CIPC plus ½ lb. of 2,4-D, amine. Post-emergence sprays of CIPC, at 8 lb./A. each, were applied at the following stages of growth: 1 true leaf, 2 leaf, 3 leaf, and when plants were 12 to 20 in. high. Different combinations of application times were used such that there were 12 treatments with the total amount of CIPC applied as post-emergence sprays varying from 0 to 32 lb./A. All applications were made in 50 gal. of water per A. and at a pressure of 26 psi. The first two post-emergence sprays were applied over the tops of the onions and the last two were directed so that only the lower one or two inches of the onion plants were contacted. The weather was clear and the soil dry on all treatment dates and the temperature varied from 80° to 92° F. Plots were replicated 4 times and were hand-weeded frequently throughout the season. The stand and growth of the onions was good and no injury was observed from any of the sprays. Yields averaged slightly over 600 bu./A. and there were no significant differences between treatments. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Ind.).

Relative tolerance of onions to several formulations of CIPC. Warren, G. F. Downing Yellow Globe onions planted March 17 on muck soil were sprayed April 21 just after emergence and while still in the "loop" stage. Six experimental formulations of CIPC in different petroleum solvents were used at 10½ lb./A. and 6 commercial formulations at 12 lb./A. Treatments were applied with a knapsack sprayer in 50 gal. of water per A. and were replicated 4 times. No injury to the onions was observed from any of the treatments. The yields ranged around 900 bu./A. and there were no significant differences between them. On June 15 the 6 experimental formulations and 5 of the commercial formulations were applied at the rate of 12 lb./A. to onions in the same field where the early experiment was conducted. The onions had been damaged by hail and rain the day before. Sprays were applied over the top of the onions and there were 5 replications. All CIPC treatments caused injury to the foliage within a few days after spraying but there were no apparent differences between formulations in amount of injury. Yields were between 903 and 1047 bu./A. with the untreated plots yielding the highest. Reductions in yield due to treatment were significant in all but one case. Based on these and previous results it appears that the contact injury to large onions often observed from over the top sprays of CIPC is not greatly influenced by the formulation used. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Ind.)

Tolerance of onions to post-emergence sprays of certain herbicides. Warren, G. F. Super Bronze onions planted April 21 in muck soil were sprayed in the 3-leaf stage on June 21 with the following herbicides: KOCN, 16 lb./A.; CIPC, 8 lb.; CDAA (alpha-chloro-N, N-diallylacetamide) 6 lb.; TCB (sodium salt

of 2,3,6 tricholorobenzoic acid), ½ lb. Each chemical was applied both as an over the top and a directed spray. In addition to these treatments, CIPC was also used at 16 lb./A. as a directed spray only. All materials were applied in 50 gal./A of water using a pressure of 26 psi. on a clear day with a temperature of 80° F. Plots were replicated 4 times and were hand-weeded frequently throughout the season. None of the treatments caused more than slight injury to the onions and this was mostly on plots where the sprays were applied over the tops. Yields were all over 600 bu./A. and none of the treatments yielded significantly less than the check. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Ind.).

The use of several pre-emergence herbicides on onions. Waywell, C. G. Four herbicides including CIPC at 3, 5, and 8 lbs./A.; bis (ethyl xanthic) disulfide (Herbisan) at 2 and 4 gal./A., Herbisan 91 at 1 gal./A.; 2-chloroethyl-N- (3-methyl phenyl) carbamate (Niagara 5523) at 4 and 8 lbs./A.; (1-chlorophenyl-2)N(3-chlorophenyl) carbamate (Niagara 5521A) were applied to onions growing on a muck soil as a pre-emergence treatment on the same day the plots were seeded. Counts of both weeds and onions were made 20 days after treatment. The weed counts on the three replicates used were as follows: CIPC 3 lbs./A. 197, 5 lbs./A. 316, 8 lbs./A. 252; Herbisan 2 lbs./A. 242, 4 lbs./A. 146; Herbisan 91 1 gal./A. 282; Niagara 5523 4 lbs./A. 330, 8 lbs./A. 439; Niagara 5521A 4 lbs./A., 324, 8 lbs./A. 438; Check 423. Onion stands were not significantly affected by treatments this past season. CIPC and Herbisan appear promising.

The same series of chemicals was used at the same rates for post-emergence treatments. Counts made of weed populations 4 weeks later were as follows: CIPC at 3 lbs./A. 286, 5 lbs./A. 346, 8 lbs./A. 196; Herbisan at 2 lbs./A. 247, 4 lbs./A. 202; Herbisan 91 at 1 gal./A. 259; Niagara 5523 at 4 lbs./A. 372; 8 lbs./A. 478; Niagara 5521A at 4 lbs./A. 353, 8 lbs./A. 419; Check 550. CIPC and Herbisan appear to be the most promising as directed sprays with the higher rates being necessary to get effective control. (Dept. of Botany, Ontario Agricultural College, Guelph, Ontario).

Potatoes

A screening test of pre-emergence herbicides for muckland potatoes. Nylund, R. E. Kennebec potatoes planted in muck soil on April 21 were sprayed on May 6 with the following herbicides: 8 lb. CIPC, 6 lb. chlorodiallyl acetamide (CDAA), 6 lb. chlorodiethyl acetamide (CDEA), 6 lb. DNBP (amine), 6 lb. chloroallyl diethyl dithiocarbamate (CDEC), 6 lb. chloroacetyl morpholine (Y2007), chlorodiethylamine triazine (Geigy 444) at 4, 8, and 12 lb., 2,4-dichlorophenoxy ethyl phosphite (E. H. #3Y9) at 4, 6, and 8 lb., 8 lb. sodium trichlorophenoxy ethyl sulphate (natrin 80S), 8 lb. isopropyl methyl phenyl carbamate (N5518), 8 lb. butyl chlorophenyl carbamate (N5519), 8 lb. chloroethyl chlorophenyl carbamate (N5520), 8 lb. chloropropyl chlorophenyl carbamate (N5521), 8 lb. chloropropyl methylphenyl carbamate (N5522), and 8 lb. chloroethyl methylphenyl carbamate (N5523). Each of these herbicides was applied to duplicated single-row plots at 35 psi. pressure and in 80 gal. water per acre. Weeds were counted two weeks after application and potato yields were obtained at harvest on August 30.

Due probably to extreme variability in grass population over the field, no significant differences in grass control were obtained. Only three herbicides

gave significant broad-leaved weed control. These were: 8 lb. CIPC, and 4 and 12 lb. Geigy #444. In total weed control, all of the carbamates (CIPC, CDEC, and N5518-5523) gave significant weed control as did CDAA, CDEA, DNBP, Y2007, Geigy #444 at 4 lb., and 3Y9 at 6 and 8 lb. Of these, only three gave weed control much over 50%: DNBP - 71%, 8 lb. 3Y9 - 71%, and N5523 - 74%. None of the herbicidal treatments significantly affected potato yields. (Paper No. 3425 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station).

Potato Pre-Screening, University Fruit Breeding Farm, 1955 (var: Kennebec)— 2 replications.

Herbicide and rate/acre[1]	Weeds/rod row on 5/20 and % weed control						Yield tubers/ acre (bu.), Aug. 30
	Broad-leaved		Grasses		Total		
	No.	%	No.	%	No.	%	
Untreated	45	—	245	—	290	—	284
8 lb. CIPC	5	89	145	41	150	48	265
6 lb. CDAA	35	22	110	55	145	50	336
6 lb. CDEA	20	56	120	51	140	52	290
6 lb. Premerge	25	44	60	76	85	71	281
6 lb. CDEC	15	67	115	53	130	55	310
6 lb. Y2007	35	22	170	31	205	29	288
4 lb. 444	10	78	160	35	170	41	326
8 lb. 444	35	22	225	8	260	10	294
12 lb. 444	10	78	205	16	215	26	294
4 lb. 3Y9	70	0	255	0	325	0	291
6 lb. 3Y9	30	33	150	39	180	38	290
8 lb. 3Y9	30	33	55	78	85	71	295
8 lb. Natrin	55	0	160	35	215	26	302
8 lb. N5518	30	33	85	65	115	60	301
8 lb. N5519	45	0	105	57	150	48	306
8 lb. N5520	20	56	105	57	125	57	322
8 lb. N5521	20	56	140	43	160	45	302
8 lb. N5522	85	0	75	69	160	45	274
8 lb. N5523	20	56	55	78	75	74	291
L.S.D., 5%	35	—	n.s.	—	83	—	n.s.
L.S.D., 1%	48	—	—	—	114	—	—

[1] Sprayed at 35 psi. pressure at 80 gal./acre on May 6; planted April 21 very dry, temp. 76° F., rh = 35, weeds in cotyledon to 1-leaf stage.

Pre-emergence weed control in muckland potatoes. Nylund, R. E. In 1955, Kennebec potatoes planted April 21 were sprayed on May 6, before emergence, with the following herbicides: 6 and 9 lb. DNBP (amine), 8 lb. dalapon, 2 lb. CMU, 10 lb. TCA (Na salt), and mixtures at the above rates of: CMU plus TCA, CMU plus dalapon, 6 lb. DNBP (amine) plus TCA, and 6 lb. DNBP (amine) plus dalapon. The herbicides were applied at 35 psi. pressure in 80 gal. water to single-row plots 22 feet long and replicated five times. At the time of application, the soil was very dry, temperature was 76° F., and weeds were mostly in the cotyledon or one-leaf stage. No rain fell during the six days preceding and six days following herbicide application. Weed species present were: Setaria spp. - 68%

Polygonum pennsylvanicum - 19%, Chenopodium album - 7%, Amaranthus retroflexus - 3%, and an unidentified sedge - 3%.

Weed counts made two weeks after herbicide application showed significant difference between treatments in broad-leaved weed control, but not in grass control. Six pounds of DNBP (amine) and the mixture of DNBP (amine) and TCA killed 100% of the broad-leaved weeds. The CMU-dalapon mixture gave 94% control, 9 lb. DNBP (amine) - 78%, and the CMU - TCA and DNBP - dalapon mixtures gave 72% control. The following treatments gave significant total weed control: 6 lb. DNBP (amine) - 69%, CMU plus dalapon - 62%, DNBP plus TCA - 61%, and DNBP plus dalapon - 58%. None of the treatments significantly affected yields of potatoes. (Paper No. 3424 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station).

Potato Pre-emergence weed control(1)

University of Minnesota Fruit Breeding Farm, 1955

Herbicide and rate applied per acre(2)	Weeds on May 20 per rod row						Yield potatoes per acre (Aug. 30)
	Broad-leaved	% W.C.	Grass Sedge	% W.C.	Total weeds	% W.C.	
	No.	%	No.	%	No.	%	Bushels
Untreated	36	—	124	—	160	—	269
6 lb. Premerge	0	100	50	60	50	69	312
9 lb. Premerge	8	78	78	37	86	46	280
8 lb. Dalopon	34	6	56	55	90	44	278
2 lb. CMU	18	50	138	0	156	2	275
10 lb. TCA (Na)	30	17	94	24	124	22	283
2 lb. CMU + 10 lb. TCA	10	72	76	39	86	46	281
2 lb. CMU + 8 lb Dalopon	2	94	58	53	60	62	272
6 lb. Premerge + 10 lb. TCA	0	100	62	50	62	61	287
6 lb. Premerge + 8 lb. Dalopon	10	72	58	53	68	58	254
L.S.D., 5% level-	24		n.s.		78		n.s.
L.S.D., 1% level-	32		—		105		—

(1) Kennebecs planted on muck April 21.
(2) Active ingredient basis. Herbicides applied at 35 psi. in 80 gal. water on May 6. Soil dry, weeds in cotyledon and 1-leaf stage. Temp. 76° F., humidity 35%. No rain 6 days preceding or 6 days following application.

Sweet Potatoes

Crabgrass control in sweet potatoes. Peterson, Lewis E. Orlis sweet potatoes were transplanted in coarse sand soil May 17 and the first cultivation was made June 1, immediately after which the weed sprays were applied at temperatures of 75-80° F. The weeds in the experimental area were 95 percent crabgrass. The following table gives weed control in hours of labor for the first

weeding, total yields of marketable sweet potatoes and rainfall data for the period June 1 to 11.

Treatment	Rate/A	Hours/A	Marketable Yield Bu./A	Rainfall	
Check	-	31	209	June 2	.08
Sesin 50W	2	10	225	5	.75
	4	9	214	6	.46
	8	8	224	11	1.06
NP(Alanap-2)	4	13	253*		
	8	12	251		
NP(Alanap-50W)	4	11	229		
	8	9	227		
Natrin 80S	2	12	237		
	4	8	230		
SES(Crag-1)	2	5	215		
	4	6	185		
	8	4	100**		

All treatments in the table gave a highly significant reduction in hours of labor over the check. SES (Crag-1) gave best control but most injury. Sesin 50W gave second best control with NP (Alanap-50W) and Natrin 80S giving nearly as good control all with no yield reduction. NP(Alanap-2) gave poorest weed control (although effective when compared to control) but a significant increase in yield. In the 1954 trials, Alanap-2 gave significant yield increases over all the other treatments including the check. The reasons for the stimulating effect of Alanap-2 is unknown to the author. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa).

Turnips

Effects of 2,4-D on turnips. Switzer, Clayton M. Since there seemed to be some uncertainty whether certain symptoms appearing in turnip fields in Southern Ontario were caused by 2,4-D contamination, the present investigation was undertaken to study the effects of known quantitites of 2,4-D on this crop. In the first experiment young (4-5 true leaves) turnip plants sowed in midsummer were sprayed with 1, 5, 10, 25, 50 and 100 ppm. solutions of 2,4-D (ethanolamine salt) by means of a knapsack sprayer. A twenty-five foot row was sprayed with each concentration and each treatment replicated three times. One week after treatment the leaves of plants treated with 5 ppm. or higher showed epinastic bending coupled with thickening at the base of each petiole. Five weeks later most of the plants sprayed with 100 ppm. were dead or dying while those treated with 50 to 25 ppm. showed marked top and root injury. Although twisting or curting of the tops of these latter plants was no longer evident, the top size was reduced 40-60% in comparison with the checks. The roots were distorted and proliferated about the neck. An elongation of the upper part of the turnip giving an "hour-glass" effect was noted in turnips sprayed with concentrations of 5 ppm. or higher.

In the second experiment turnips that had been planted in June were treated when the roots were 2-4 inches in diameter. Amine 2,4-D was used at concentrations

of 50, 100, and 500 ppm. and the treatments were applied and replicated as in the first experiment. One week after treatment the leaves of all sprayed plants showed epinasty and were reddish in colour in comparison with the checks. Two weeks later translucent nodules were noted on young roots of the 500 ppm. treatment. By 5 weeks after treatment the cambium and phloem area of the turnips had become bright orange in colour. Preliminary analysis of the pigment indicates that it is carotene, apparently built up in response to the 2,4-D. The lowest concentration of 2,4-D (50 ppm.) decreased average weight from 25 to 19 oz. (24%) and average diameter from 4.1 to 3.4 in. (15%), and the highest concentration (500 ppm.) decreased weight 40% and diameter 25%. (Contributed by the Dept. of Botany, Ontario Agricultural College, Guelph, Ontario).

Other Vegetables

Summary

G.F. Warren

Beans. In several pre-emergence experiments with snap and lima beans on mineral soils, DNBP gave consistantly good results, while CIPC was somewhat less effective in controlling weeds. One abstract reports better results with a mixture of DNBP and CIPC, or either of these mixed with low rates of CMU, than with any one herbicide alone. In a single experiment CDAA, CDEA and CDEC all showed definite promise on snap beans. Other herbicides tried on mineral soil either injured beans or failed to give satisfactory weed control. Several materials tested on muck soil did not damage the crop but weed control was poorer than in the experiments on mineral soils.

Tomatoes and Peppers. Sodium 2,4,5-trichlorophenoxyethyl sulfate was applied to tomatoes at various times after transplanting. In one experiment severe injury and 60 to 90 percent losses in stand resulted while in the other injury was much less severe but yields were reduced. Peppers showed more tolerance than tomatoes to this herbicide.

Other Crops. Abstracts are included which give information on weed control in asparagus, broccoli, cabbage, cantaloupes, cucumbers, watermelons, safflower, sweet corn and peppermint. Due to the diversity of the information contained in these they cannot be satisfactorily summarized and the reader is referred to the individual abstracts.

Abstracts

Beans

Chemical weed control in green beans. Hemphill, D.D. DNBP (Premerge), 4 pounds per acre; CDAA (2-chloro N-N-diallyl acetamide), 8 pounds per acre. CDEA (2-chloro N-N-diethyl acetamide), 8 pounds per acre, CDEC (2-chlorallyl-diethyl-dithio carbamate) 8 pounds per acre and 3Y9 (tris- (2-4 dichlorophenoxy-ethyl phosphate) 6 pounds per acre were applied one day after planting to four replicated randomized plots of green beans, variety Top Crop. All chemicals gave satisfactory weed control. 3Y9 caused severe damage almost eliminating stand. Yields per 25 ft. plot were as follows: Control - 10.44 pounds; DNBP - 10 pounds; CDAA - 10.75 pounds, CDEA - 11.94 pounds; CDEC - 15.75 pounds. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri.)

Chemical weed control on snap beans. Lana, E.P. Three herbicides were tested as pre-emergence sprays at two rates; NP sodium salt (Alanap #3) 4 and 8 lbs, DNBP 3 and 6 lbs, Chloro IPC 4 and 8 lbs. Under field conditions existing, warm temperatures and below normal rainfall, NP gave best weed control, DNBP next and Chloro IPC poorest. Weed count reduction varied from 97% with NP, 8 lbs. to 85% with Chloro IPC, 4 lbs. No cultivation was necessary in the NP plots, while at the time of the 3rd (last) harvest, the weeds in the Chloro IPC plots were becoming unsightly and cultivation was necessary. Both rates of NP showed formative effects on the young plants. At fruiting stage these plants appeared to have recovered from these early effects. Yield data indicated that yields were reduced at both rates of NP but not significantly so; the reduction was just short of the 5% probability value. DNBP produced the largest yields with the 6# rate producing yields significantly greater than the non-treated plot. (Horticulture Department, Iowa State College, Ames, Iowa).

Pre-emergence weed control in snap beans. Nylund, R.E. Topcrop snap beans seeded in muck soil on May 12 were sprayed immediately after seeding with the following herbicides: 8 lb CIPC, 1.6 lb CMU, 8 lb amino triazole (ATA), 6 and 9 lb DNBP, amine (Premerge), 8 lb chlorodiethylamino triazine (Geigy No. 444), and 6 lb chloro diallyl acetamide (CDAA). All herbicides were applied in 80 gal. water per acre at 35 psi. pressure. Rainfall during the six days preceding herbicide application totalled 0.65"; none fell during the six days following application. Weed counts made two weeks after application indicated that none of the treatments had controlled grass weeds. The following herbicides gave statistically significant control of broad-leaved weeds: CMU (60%), ATA (64%), 6 lb Premerge (68%), and Geigy No. 444 (88%). Inasmuch as none of the treatments visibly affected growth of the bean plants, yields of beans were not recorded. (Paper No. 3429 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station).

Pre-emergence herbicide treatments on lima beans, snap beans and sweet corn. Singletary, C.C. and Herron, J.W. On July 6, 1955 DNBP 4 lb/A; CIPC 6, 8 lb/A; SES 4, 6 lb/A and Natrin 4, 6 lb/A were applied in 50 gal/A of water immediately following planting of Topcrop snap beans, Fordhook 242 lima beans and Golden Cross sweet corn. Each treatment was replicated 5 times. In each plot the rows were spaced 3 feet apart and applications were made with a knapsack sprayer to the entire area. The plots were not cultivated or weeded during the growing season and no herbicide treatments were made following the initial applications. Treatments with DNBP and CIPC resulted in higher yields and more satisfactory weed control than treatments with any of the other herbicides. The highest yields were obtained on plots treated with DNBP. Results of this experiment indicate that under certain conditions, cultivation for weed control may be eliminated from lima beans, snap beans, and sweet corn by pre-emergence treatments with certain chemicals. (Kentucky Agricultural Experiment Station, Lexington, Kentucky)

A summary of three years work with pre-emergence sprays on snap and lima beans. Welker, W.V. and Holm, L.G. Tendergreen snap beans were planted in a Miami silt loam soil in a four replication randomized complete block test each year. Uniform stands were obtained by hand planting. Pigweed (Amaranthus retroflexus), lamb's quarters (Chenopodium album), barnyard grass (Echinochloa crus-galli), and foxtail (Setaria spp.) were the predominant weeds in the areas. The following chemicals were applied alone and in mixtures three days after planting: CMU, CIPC, DNBP, NP, PCP, and endothal. All rates are given in pounds per acre of active ingredient. The treatments which have consistantly shown good results are CMU 3/4 or 1 plus CIPC 4, CMU 3/4 or 1 plus DNBP 8, and CIPC 4 plus DNBP 8. These treatments averaged 96 percent weed control for the first six weeks, caused no reduction in yields, and required no hand weeding before harvest. CMU at the rate of 1 1/2 pounds, which approaches the limit of tolerance for beans, was slightly less effective in control of weeds and did not reduce yields on this soil type. DNBP at 8 pounds provided 60 to 80 percent weed control without crop injury. The DNBP plots required hand weeding before harvest. There were no formative effects on the leaves, flowers, or fruits as a result of the above treatments.

A comment on the performance of the individual herbicides and the effect of the weather conditions during these three seasons may be in order. In two of the three years an inch or more of rainfall occurred within a week of application and the temperatures were above normal for the same period. During the third year only a trace of rainfall occurred within a week of application while the temperatures were below normal. In these tests, adequate rainfall during the period of weed seed germination was favorable for the action of NP and CMU. In those instances in which dry periods followed the application of these herbicides, the weed seedlings

which had emerged were not controlled. In contrast, DNBP and CIPC were more effective in the control of emerged weed seedlings when rainfall finally came after a dry period.

Similar studies were made on lima beans for a three year period. Tolerance of this crop to the herbicides varied slightly from that of snap beans but the weed control results were quite similar. Lima beans show greater tolerance to NP but were more easily injured by CMU. In one instance, CIPC and NP, which were leached into the soil during seven consecutive days of rain following planting, caused a delay in emergence. This later resulted in a physical entrapment of the cotyledons when the rain ceased and the soil crusted. Those plants which emerged successfully were only slightly delayed and thereafter grew normally and yielded well.

In summary of these tests it may be said that mixtures of CIPC or DNBP with a chemical such as CMU, which has a longer period of residual activity in the soil, will result in better weed control for a longer period. It has been shown in these experiments, as well as those of others, that mixtures of the appropriate chemicals are capable of controlling a greater number of weed species than will normally be controlled when either chemical is used alone at the highest rate which the crop will tolerate. (Department of Horticulture, University of Wisconsin, Agricultural Experiment Station, Madison, Wisconsin)

Tomatoes and Peppers

Weed control in peppers and tomatoes. Hemphill, D.D. Natrin (sodium 2,4,5-trichlorophenoxyethyl sulfate) was applied as a foliage spray to pepper and tomato plants immediately after transplanting, two weeks after transplanting or four weeks after transplanting at rates of 2, 3 or 4 pounds per acre. All treated tomato plants were severely injured. Stand was reduced by 60 to 90 percent in different treatments. Peppers exhibited more tolerance than tomatoes. The 2 pound rate appears safe to use immediately after transplanting and the 3 and 4 pound rates appear safe for use 4 weeks after transplanting. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

The use of Natrin for weed control in tomatoes. Oebker, N.F. Brockston tomatoes were transplanted from bands into the field (silt loam) on May 26. These tomatoes were sprayed with Natrin (sodium 2,4,5-trichlorophenoxy ethyl sulfate) on May 31, June 30, or July 26 at rates of 3 and 6 pounds per acre. No plot was treated with Natrin more than once. The treatments were replicated five times. All treatments caused a reduction in yield of tomatoes; this was true for total marketable fruits as well as for U.S. No. 1 fruits. The results of this study have not been completely analyzed, but where Natrin was applied there was at least a 16% reduction in yield. Plants sprayed with 6 pounds on May 31 showed reduced growth, and plants sprayed with 6 pounds on July 26 exhibited injury on the foliage. Rainfall was near normal during application of chemicals but a period of hot, dry weather occurred during late July and early August. (Deparment of Horticulture, Illinois Agricultural Experiment Station, Urbana, Illinois.)

Other Crops

Herbicides for cole crop transplants. Hemphill, D.D. Broccoli and cabbage transplants were sprayed with Natrin (sodium 2,4,5-trichlorophenoxyethyl sulfate) at two rates (2 or 4 pounds/acre) at three different dates (1 week, 2 weeks or 4 weeks after transplanting) and with TCA, 8 pounds/acre as a basal directed spray 1 week after transplanting. Natrin, 2 pounds/acre, applied one week after transplanting shows some promise. Higher rates caused injury.

TCA gave satisfactory control of weeds which were primarily grasses and no evidence of injury. Yield of TCA treated plots exceeded that of hand weeded control plots. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Chemical weed control in cucurbits - 1955. Hemphill, D.D. Following chemicals were evaluated as pre-emergence herbicides in cantaloupes, cucumbers and watermelons: DNBP (Premerge), 4 pounds/acre; NP (Naphthyl phthalamic acid), 4 pounds/acre; CDEC (2-chloroallyl-diethyl-dithio carbamate), 6 pounds/acre; and DCU (dichloral urea), 10 pounds/acre. DCU, 10 pounds/acre, was also used as a pre-planting treatment being worked into the soil 2 weeks before planting. All chemicals gave satisfactory weed control for approximately one month with CDEC being the least effective. CDEC caused stunting in cantaloupes and reduced yields but no injury was evident in cucumbers and watermelons. Yields of all other treatments were comparable to hand weeded control plots. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Pre-emergence weed control in sweet corn. Hemphill, D.D. SES, 4 pounds/acre; CDAA (2-chloro N-N-diallyl acetamide), 8 pounds/acre; CDEA (2-chloro N-N-diethyl acetamide), 8 pounds/acre; CDEC (2-chloroallyl-diethyl-dithio carbamate), 8 pounds/acre and TCB (2,3,6-trichlorobenzoic acid) 1½ pounds/acre were applied pre-emergence to four replicated randomized plots of sweet corn, variety Golden Cross Bantam. SES caused stunting and reduced yields. TCB caused rolling of leaves until plants were about 3 feet tall. Yields per 25 ft. plot were as follows: Control - 22.25 pounds, SES - 14.81 pounds, CDAA - 23.25 pounds, CDEA - 23.0 pounds, CDEC - 24.56 pounds, TCB - 16.56 pounds. All treatments gave satisfactory weed control. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri)

Pre-emergence herbicides on safflower. Keyser, H.R. and Williams, J.H. Safflower (N8 and N10) were planted April 25, 1955. Triplicate plots 10' x 16' were sprayed April 30, 1955 with CIPC at 6, 8, and 10 lb/A; CMU at 1 and 2 lb/A; and Geigy 444E (2-chloro-4,6-bis-(diethylamino)-s-triazine) at 2,4, and 8 lb/A. Chemicals were applied in 80 gallons of aqueous solution per acre. The soil surface was dry at the time of application and no rain was received until three weeks after treatment. RESULTS: Geigy 444E at 2,4, and 8 lb/A gave 67, 77, and 88% weed control. Geigy 444E reduced the stand and stunted the safflower in proportion to the rate of chemical applied. CIPC at 6, 8, and 10 lb/A gave 28, 47, and 47% control. None of the rates of CIPC injured the safflower. CMU at 1 and 2 lb/A gave 48 and 65% control. CMU at both rates stunted the safflower slightly. The weed population was composed of rough pigweed (Amaranthus retroflexus), Russian thistle (Salsoli kali), and ground cherry (Physalis heterophylla). (Contribution of University of Nebraska Experiment Station, North Platte, Nebraska; Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska and Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

Weed control in asparagus. Lana, E.P. CMU at 3 lb/A, SES at 4 lb/A, NP sodium salt (Alanap 3) at 4 lb/A and a mixture of 2,4-D amine at 2 lb/A and TCA at 6 lb/A were used on a commercial planting of asparagus. All materials gave excellent control of weeds. Environmental conditions were apparently conducive for weed control. The temperatures in the last week of April and first week of May were unseasonably warm and there was a sufficient supply of ground moisture available. Yields were not obtained. Comments by the canner indicated savings by ease of harvest and no loss of harvest during mid-season due to supplimental cultivations. No cultivation was necessary on the treated areas until the end of the harvest,

approximately June 20. (Horticulture Department, Iowa State College, Ames, Iowa).

Pre-emergence weed control in peppermint. Warren, G.F. Replicated experiments on new plantings of peppermint have been conducted for three years on muck soil. Stolons were planted 2 to 3 inches deep in April and the following herbicides applied 5 to 10 days later, just before emergence of shoots: CIPC, 4 and 8 lb/A; DNBP, amine salt, 6 and 9 or 10 lb; mixtures of these two chemicals. Smartweed (Polygonum spp.), ragweed (Ambrosia artemisiifolia), purslane (Portulaca oleracea) and annual grasses were the weeds most commonly present. One year CIPC alone at 8 lb gave excellent weed control while 10 lb of DNBP alone failed. Another year DNBP alone at 9 lb gave excellent results while 8 lb of CIPC controlled some species but not others. In the third experiment each herbicide failed to kill one species that was killed by the other, such that the only fully satisfactory results were obtained with the mixtures. The differences in results obtained in each season appeared to be due to variations in weed species present and in percentage of weeds emerged at the time of treatment. Since the mixtures gave consistantly good weed control in all experiments they would be preferable to either herbicide alone. None of the treatments reduced the yield of peppermint oil in any of the three years. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Ind.)

FRUITS

Summary

D. D. Hemphill

Apples. In an experiment to control vegetation around newly-transplanted apple trees CPCPC (1-chloropropyl-2) N-(3 chlorophenyl) carbamate) and DNBP fortified oil spray were the most satisfactory of several chemicals tested. CPCPC appeared superior to CIPC in ragweed control. CMU 2 lbs./acre caused considerable injury.

Cranberries. To determine the tolerance of cranberries to herbicides a number of chemicals were applied as the fruit buds began to swell and a second application was made about four weeks later just prior to bloom. Results indicated that cranberries will tolerate early spring applications of SES, MH, NP, 2,4-D (amine) and KOCN and late spring applications of SES, MH and KOCN.

In another experiment Dalapon applied after harvest was tested for the control of wide leaf grass (Corex rostrata). There was a 95 per cent reduction on wide leaf grass but next year's crop was lost due to a failure of flower buds to open. A marginal yellowing of leaves was evident for several weeks in the spring.

Grapes. CIPC and CMU continue to give excellent control of weeds beneath the trellis in grape vineyards. These chemicals appear superior to dinitro fortified oil in that one application applied to weed-free soil gives weed control for the entire season. Chlorosis of leaves of young plants in 1954 and again in 1955 indicate that CMU should be used in mature vineyards only. CIPC has caused no detectable injury.

Raspberries. SES, SESIN and NATRIN (sodium 2,4,5-trichlorophenoxyethyl sulfate) were effective in controlling annual weeds in a red raspberry planting and plots treated with these chemicals gave yields the following season not significantly different from that of hand weeded control plots. NATRIN and SESIN showed longer residual properties than SES.

Strawberries. SES, SESIN, NATRIN, Methin (sodium 2 methyl 4 chlorophenoxyethyl sulfate), CIPC, DCU, 2,4-D and TCB (sodium salt of 2,3,6 trichlorobenzoic acid) were applied for the control of annual weeds in 1st year strawberries. SES, SESIN, NATRIN, Methin and DCU caused no apparent injury at rates of 3 to 4 lbs./acre and the number of rooted runner plants per plot was not significantly different from the check. CIPC reduced runner plants by 60 per cent 2,4-D, 30 per cent and TCB 70 to 90 per cent. SES and NATRIN appear the most promising chemicals for use in 1st year fields with NATRIN exhibiting longer residual properties.

An application of CIPC 4 lbs./acre on April 1st on dormant strawberry plants was effective in the control of overwintering seedlings of shepherds-purse (Capsella bursapastoris) and did not injure the strawberries.

Abstracts

Weed control around newly transplanted apple trees. Hemphill, D. D. To eliminate hand cultivation several chemicals were evaluated as herbicides for use around newly-transplanted apple trees. Immediately after planting orchard was seeded to bluegrass and ladino clover with oats as a nurse crop. The oats had germinated before the herbicides were applied. Approximately 600 trees, varieties Delicious, Golden Delicious and Jonathan were included in the experiment. An area about 6 x 6 feet was treated around each tree.

The following chemicals and rates were used: CIPC - 14 lb/acre, CPCPC (1-chloropropyl-2) N-(3 chlorophenyl) carbamate) - 14 lbs/acre, CMU 2 lb/acre, Dalapon - 2 lb/acre, CMU 2 lb plus Dalapon 2 lb/acre, Dinitro fortified oil spray (20 gal oil + 2 qt DNBP in 100 gal) - 80 gal/acre.

Results were as follows: CIPC - no injury to trees, excellent control of all weeds except common and giant ragweed and trumpet-creeper. Unsatisfactory where heavy infestation of ragweed seed was present. CPCPC - no injury to trees, excellent control of all weeds except trumpet-creeper and ragweed, satisfactory control of ragweed in most instances. CMU - excellent control of all weeds except trumpet-creeper but caused chlorosis and stunting or killed approximately 50 per cent of treated trees. Some trees showed no evidence of injury but this was not a varietal response. Dalapon caused no injury but failed to control broad-leaved weeds satisfactorily. CMU + Dalapon gave similar results to CMU alone. Dinitro fortified oil controlled most weeds for approximately 3 weeks. No injury to trees was evident.

CPCPC gave weed control throughout the season and was therefore, the most satisfactory treatment although control of ragweeds could be better.

Dinitro fortified oil is satisfactory if 2 or more applications are made at approximately 4 week intervals. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Tolerance of Cranberries to Herbicides. Dana, M. N. A number of herbicides were used to treat duplicate plots in a producing cranberry field. The materials were applied with a bicycle sprayer using 40 gallons per acre of solution at 22 psi. Notes on leaf injury, flower injury, fruit bud set and yield were made at intervals during the growing season.

Chemicals used were (rates are in pounds per acre of active ingredient) SES 4, 8 and 12; NP 5, 10 and 15; MH 4, 8 and 12; Endothal 10 and 20; KOCN 5 and 10; DNBP 8, 12 and 16; 2,4-D amine .25 and .50.

The first application was on May 21 when the cranberries were in the white bud stage (buds starting to swell). No laaf or flower injury, decrease in fruit bud set, or yield reduction resulted from the SES, MH or 2,4-D amine treatments. NP at the highest rate caused a slight marginal browning on the cranberry foliage with no flower injury or yield reduction. Endothal completely defoliated the old wood and destroyed the fruit crop. New growth was good and an adequate fruit bud set developed. KOCN caused slight foliar browning at the high rate but did not hurt the crop. DNBP caused severe browning of old leaves, but did not defoliate the plants. The yield was reduced by 50 percent. Vine recovery was good and by fall the plants appeared to be normal.

A second application of the same treatments was made on June 23 when the vines were in the "hook" stage (just prior to bloom). SES at the highest rate caused a slight chlorosis on old leaves but did not prevent growth of uprights, nor reduce the yield. Fall fruit bud formation was normal.

Vines in the NP plots developed a light green leaf color with marginal yellowing on new leaves, terminal growth was reduced, fruit bud formation was prevented, and the yield was reduced by 75 to 100 percent. The injury became more pronounced as the season progressed. MH caused no symptoms on the cranberry vines. Endothal

defoliated most of the vines, prevented formation of fruit buds and destroyed the fruit crop. KOCN reduced the crop substantially but did not hurt fruit bud set. DNBP defoliated the vines and at the two highest rates of application killed the plants. 2,4-D amine at both rates destroyed the blossoms but did not prevent fruit bud set for next year's crop.

The results of this experiment indicate that the cranberry plant will tolerate without serious injury early applications of SES, MH, NP, 2,4-D amine and KOCN and will tolerate late spring applications of SES, MH and KOCN. With this knowledge it is possible to proceed with studies to determine if these materials may be used successfully to control certain annual and perennial weeds in cranberry fields. (Contribution of Department of Horticulture, Agricultural Experiment Station, Madison, Wisconsin).

Dalapon as a Control for Wide Leaf Grass (*Carex rostrata*) in Cranberry Fields. Dana, M. N. Preliminary results in the summer of 1954 showed that cranberry plants were tolerant of applications of dalapon as high as 12 pounds per acre. After harvest a section of marsh heavily infested with wide leaf grass (*Carex rostrata*) was laid out in 20 x 25 foot plots. Treatments were replicated 3 times. The material was applied as a spray with a bicycle sprayer using 40 gallons per acre and using a pressure of 22 psi. Rates were 6, 12 and 18 pounds per acre. The field was flooded for winter protection about December 1. The winter flood was removed about April 1.

Injury to the wide leaf grass was first observed on May 10 when the tips of the leaves were brown and a few older leaves were dead. In succeeding weeks the sedge sent up new shoots which slowly dried up and died. By midsummer the herbicidal effect was completed and population counts showed that there was a 95 percent or more reduction of wide leaf grass in all plots. The check plots had approximately 2,000 wide leaf plants per plot.

Two plots on the lower side of the field showed the least control which indicated that dalapon was not as effective under these poorer drainage conditions.

All treatments destroyed the 1955 crop of fruit. Vine growth was slightly retarded but at the end of the growing season all plots had made excellent terminal growth and have produced a fine set of fruit buds for next year's crop.

Flower buds on treated vines developed normally up to the time of blossom opening when the petals failed to separate and fold back against the pedicel in the normal fashion. The petal tips stuck together while the base of the petals expanded which resulted in a Japanese-lantern-effect or a ballooning. Flowers injured in this way did not pollinate and set fruit. Leaves of treated vines developed a slight marginal yellowing that persisted for several weeks and then disappeared.

From this experiment it appears that an after-harvest application of 6 pounds per acre of dalapon should give adequate control of wide leaf grass with a minimum retardation of the cranberry vines. (Contribution of Department of Horticulture, Agricultural Experiment Station, Madison, Wisconsin).

Chemical weed control in grape vineyards. Hemphill, D. D. Chemical weed control experiments were continued for the 6th year in a grape vineyard of mixed varieties. During this period various chemicals have been compared with dinitro fortified oil and the following have been eliminated as inferior in weed control

properties or as injurious: Endothal, SES, NP and phenyldimethyl urea.

In 1955 CMU, 2 lb/acre, CIPC 14 lb/acre and CECPC 14 lb/acre (2-chloroethyl N (3-chlorophenyl) carbamate) were compared with dinitro fortified oil. To determine if toxic residues will build up after prolonged treatment chemicals are applied to the same plots each year. CMU plots have been treated four times and CIPC plots have been treated 3 years.

Treatments were made April 15 after all vegetation had been removed and weed counts were made June 13. Compared to control plots CMU gave 100 per cent control of grasses and 86 per cent control of broadleaved weeds; CIPC - 98 per cent grasses and 86 per cent broadleaved weeds. CECPC - 74 per cent grasses and 00 percent broadleaved weeds; Dinitro fortified oil - 35 per cent grasses, 00 per cent broadleaved weeds. Poor performance of CECPC was due possibly to a precipitation of the active ingredient in the formulation. Plots treated with CECPC were hand weeded after June 13 and retreated with CPCPC (1-chloropropyl-2) N-(3 chlorophenyl) carbamate) 14 lb/acre which gave satisfactory weed control for the remainder of the season.

One treatment of CMU and CIPC gave satisfactory weed control for the entire season.

No evidence of injury has been noted in CIPC treated plots. Severe chlorosis of leaves of young transplants has been noted in 1954 and 1955 in CMU treated plots which indicates that CMU should be used in mature vineyards only. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Chemical weed control in small fruits. Denisen, E. L. Yields of Latham raspberries and Premier strawberries were recorded during the 1955 season from plots treated with several herbicides the preceding year. No significant differences were found between the herbicide treatments and the hand weeded checks. Herbicide treatments consisted of SES at 4 lb/A; SESIN (benzoate form of SES) at 4 lb/A; SESIN at 6 lb/A; NATRIN (sodium 2,4,5-trichlorophenoxyethyl sulfate) at 4 lb/A; and NATRIN at 6 lb/A. These treatments were applied once to the raspberries and twice to the strawberries the previous year and all were effective in controlling annual weeds. NATRIN and SESIN showed longer residual properties than SES. CIPC was applied at 4 lb/A to strawberries on April 1, 1955, while the plants were still dormant, for control of overwintering seedlings of shepherds purse (Capsella bursapastoris). Very effective weed control was obtained without injury to the strawberries. Other principal weeds controlled were foxtail and smartweed. No additional herbicide sprays or cultivation was needed prior to the harvest in early June. (Contribution of Department of Horticulture, Iowa State College, Ames, Iowa).

Weed control in strawberries. Herron, J. W. and Chaplin, Carl E. The results of 1954 tests showed that SES and Natrin were the most promising materials for weed control in strawberries. Both materials applied at low rates gave satisfactory weed control without causing inhibition of runner formation or rooting. Production was not significantly affected. Therefore, these two herbicides were used in the 1955 tests. The variety used was Tennessee Beauty. Each material was applied at the rates of 3, 4, 6 lb/A in 100 gal of water. Each treatment was replicated five times and consisted of an area 10 ft. by 2 ft. centered over rows spaced 4 ft. apart. The initial treatments were made approximately two weeks after setting of the plants. On one series of plots, three additional treatments were applied at approximately six week intervals. On another series of plots, two early applications were followed by two late applications after the rows had formed. Data

are not yet complete, but it appears that there was no inhibition in runner formation and rooting of plants treated with the lower rates of either SES or Natrin. Rooting in plots treated with the higher rates of both materials appears to have been inhibited. (Kentucky Agricultural Experiment Station, Lexington, Kentucky).

Tolerance of strawberries to certain herbicides. Warren, G. F. Premier strawberry plants were set May 6 in a silt loam soil containing 3% organic matter. On June 3, the following treatments were applied in 100 gal of water per acre: SES, 4 lb./A; Methin (sodium 2 methyl 4 chlorophenoxyethyl sulfate), 4 lb; Natrin (sodium 2,4,5 trichlorophenoxyethyl sulfate), 4 lb: DCU (dichloral urea), 6 lb; CIPC, 6 lb; 2,4-D amine, 1 and 2 lb; TCB (sodium salt of 2,3,6 trichlorobenzoic acid), 1 and 2 lb. On July 11 all the treatments except 2,4-D and TCB were repeated on the same plots. The weather was clear when the sprays were applied. Rainfall during the two weeks following the spraying of June 3 was 3.60 in, and following July 11 was 4.28 in. There were five replications and all plots were hoed and cultivated throughout the season. SES, Methin, Natrin and DCU caused no apparent injury to the strawberries and the number of rooted runner plants per plot on October 14 was not significantly different from the check. CIPC stunted the strawberries and reduced the number of runner plants by 60%. The single application of 2,4-D caused some temporary distortion of the original plants and a 30% reduction in runner plants at both rates. TCB resulted in severe stunting and distortion and a reduction in runner plants of 73 and 96% respectively at the 1 and 2 lb rates. (Contribution of Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

ORNAMENTAL NURSERIES, FOREST NURSERIES, SHELTERBELTS, AND ALL OTHERS

Summary

J. P. Mahlstede

Reports concerned with the control of herbaceous weeds in ornamental nurseries were received from three stations.

Mid-summer applications of Natrin at the rate of from 2 to 6 #/A as a pre-emergence herbicide gave satisfactory control of broadleaf weeds without injury to one-year-old Taxus cuttings in beds. Applications reduced the number of cultivations necessary to control weeds by 50% and the amount of time required to weed treated beds by one-half as compared to the control plots.

Mixtures containing ½#/A CMU and 4#/A SES applied as a pre-emergence herbicide to a general line of evergreen transplants and established plants of Taxus cuspidata intermedia show promise for control of a greater number of weed types over a longer period of time. Some injury, as depicted by a slight burning and stunting on Red Cedar was noted over a two-year period from the use of mixtures containing SES and NP at the rate of 2½# of each constituent /A.

Vapam applied at the rate of 1 to 2 quarts/100 sq. ft. in 15 gallons of water to weed-free soil in transplant beds resulted in satisfactory weed control.

Abstracts

Chemical weed control in a Taxus nursery. Chadwick, L. C., P. A. Barker, and W. D. Chambers. During 1955 tests were made in a field nursery of five-year Taxus cuspidata intermedia at Columbus, Ohio, to determine the effectiveness of controlling weeds when in the germinating seed and seedling stages. On June 16 and August 4, plots 500 sq. ft. in size, replicated twice, were treated with the herbicides at rates given in the table below. All applications were made in water equivalent to 86 gal/A. Previous to each treatment all weed residue, resulting from cultivation and hand hoeing, was removed from the nursery. Moisture in the Brookston silt loam soil was near field capacity on August 4 but somewhat lower on June 16. Visual evaluations of weed prevalence, made 4 and 6 weeks after each series of treatments, were averaged and computed in terms of broad leaf weed control as shown in the table below.

Treatment & rate, lb/A	Treatment series, application date June 16	August 4
	% Weed control *	
CMU, ½	46	20
SES, 4	31	60
CMU, ¼ plus SES, 3	31	86
CMU, ½ plus SES, 3	46	86
CMU, ½ plus SES, 4	75	96
	% Weed prevalence	
Check	60	50

* Weed control = $\frac{A - B}{A}$, where A = weed prevalence in check plots and B = weed prevalence in treated plots.

Quack grass, field bindweed, and Canada thistle were abundant in many of the plots and, except as indicated below, none of them were damaged nor suppressed by any of the treatments. These weeds, which originated from deep residual roots were disregarded in weed control evaluation. Of the weeds originating from seed following the treatments, pigweed and purslane were the most prevalent in all the plots and the figures presented in the table above are largely representative of the control of them. Best weed control was obtained in plots treated with CMU at ½ lb/A plus SES at 4 lb/A. This latter treatment also damaged Canada thistle severely.

In another series of tests, plots 7 by 200 feet in size, each consisting of two rows of Taxus, were treated on June 25 and again on August 13 with SES, NP, and CIPC at the respective rates of 4, 5, and 7.5 lb/A. Plot preparations and application techniques were similar to those listed above. No precise estimates could be made of the weed control following either treatment since weeds were unusually scarce in both the check and the treated plots. Neither the tops nor the roots of the Taxus were damaged by any of the treatments used in this experiment. (Department of Horticulture, Ohio Agricultural Experiment Station, Wooster, Ohio).

Tolerances of certain nursery stock to CMU and SES. Chadwick, L. C. and P. A. Barker. To determine the tolerances of certain ornamentals, potted plants of two-year old Norway spruce, Japanese maple, and flowering dogwood, three-year old Taxus cuspidata intermedia, four-month old Forsythia intermedia spectabilis (age from cuttings), and two-month old marigold were treated with 1 to 4 applications of CMU, SES, or combination of CMU and SES at respective rates of ½, 4, and ½ and 4 lb/A. The replicated plots contained 10 plants of each species of plant. Time lapse between each application was about 10 weeks. From half the plants in each plot, the excess water that leached from the pots was collected and returned to the pot soil weekly to compare the plants with those plants where the leachate was lost.

Results: In those plots where the treatment had included CMU, necrosis appeared on the foliage tips of the marigold within one week after the first application. Five weeks later all the marigolds in those plots were either killed or damaged severly. The marigolds in the plots treated only with SES remained the same as those in the check plots. Many of the leaf petioles of the flowering dogwood became twisted and the plants were eventually killed where the treatments had included SES. Prior to the second application, the flowering dogwood and marigold plants were discarded. With the remaining plant types no damage has appeared through the third application. No significant difference could be assessed where the leachate was returned to the pot soil. (Department of Horticulture, Ohio Agricultural Experiment Station, Wooster, Ohio)

Soil sterilization with Vapam and sodium chlorate. Chadwick, L. C., P. A. Barker, and W. D. Chambers. Soil sterilization for the purpose of eliminating all vegetative growth was done in unplanted lath house beds and field areas where container nursery stock was to be placed. Used in the tests were sodium chlorate and Vapam 4-S, a soil fumigant solution of sodium N-methyl dithiocarbamate (anhydrous). Treatments were made during May, 1955, after the areas had been clean cultivated. In nursery #2, sodium chlorate was applied with the use of a hydraulic sprayer at the rate of 1 lb in 2 gal of water per 100 sq. ft. Elsewhere the sodium chlorate and Vapam 4-S was applied through a watering hose equipped with a Hozon at the faucet and a "rose flare" at the unattached end. By this method the respective herbicides were mixed with 16 gal. of water to every 100 sq. ft. of surface area. Part of the area treated with Vapam 4-S or sodium chlorate was covered with 1½ inches of crushed limestone following the herbicide application. To assess the

resulting weed populations, weed counts were made in the lath house and visual estimates were made elsewhere. All areas were free of vegetation for at least 4 weeks after treatments. Weed control 16 to 18 weeks after treatment are given below.

Plot location surface treatment	Treatment	Rate, per 100 sq ft	% Weed control * Broad-leaves	Grasses
Lath house, not graveled	Vapam 4-S	1 pt.	72	91
Lath house, not graveled	Vapam 4-S	2 pt.	91	100
Nursery #1, graveled	Vapam 4-S	2 pt.	-	90
Nursery #1, graveled	none	-	-	30
Nursery #1, graveled	Sodium chlorate	1 lb.	-	65
Nursery #1, not graveled	Sodium chlorate	1 lb.	-	45
Nursery #2, not graveled	Sodium chlorate	1 lb.	0	0

* Weed control = $\frac{A - B}{A}$, where A = weed prevalence in check plots and B = weed prevalence in treated plots.

Satisfactory soil sterilization was obtained throughout the areas where Vapam was used. Neither a layer of gravel nor sodium chlorate, when used at the above rate, gave suitable weed control. (Department of Horticulture, Ohio Agricultural Experiment Station, Wooster, Ohio).

Weed control in Taxus media wardi. Herron, J. W. Plant beds containing Taxus media wardi, at Hillenmeyer Nurseries, were treated with SES 2, 4, 6 lb/A, Natrin 2, 4, 6 lb/A, and Alanap-1 4, 6, 8 lb/A during the summer of 1955. The amount of water used was at the rate of 100 gal/A. The plants were rooted in the spring of 1955 and transplanted in beds in early June. Each test plot consisted of 160 square feet. Initial applications were made on July 12. Subsequent applications were made on August 1, August 17, and September 6. All materials were applied with a knapsack sprayer. Prior to each treatment the beds were cultivated and hand weeded. When necessary, irrigation was practiced throughout the growing season. Excellent weed control of broadleaf plants was obtained from treatments of Natrin at the 4 and 6 lb/A rate. Weed control in plots treated with Natrin 2 lb/A was better than applications of SES or Alanap at the higher rates. All rates of Natrin controlled at least 60 per cent of the grass while SES and Alanap controlled less than 35 per cent of the grass. Although some treatments did not give satisfactory control of the germination of weed seeds, plant growth on treated plots was much less vigorous than that on the check plots. By chemical treatments, half the number of cultivations were eliminated, and when weeding was necessary the time required to hand weed the treated plots was at least 50 per cent less than that required to hand weed check plots. No injury to the Taxus plants was observed from any of the treatments. (Kentucky Agricultural Experiment Station, Lexington, Kentucky).

Weed control in coniferous nursery stock. Taylorson, Ray and L. G. Holm. Two year old seedlings of Blue Spruce, Black Hills spruce, Norway spruce, Scotch pine, Red cedar, Austrian pine, White pine, Arbor vitae, and Douglas fir were transplanted to research plots on a sandy loam soil in a commercial nursery in the fall of 1953. The predominant weed species in the area were lambs quarters (Chenopodium album), shepherds purse (Capsella bursa-pastoris), peppergrass (Lepidium virginicum), bindweed (Convolvulus arvensis), and annual grasses. Herbicides were applied to clean weeded plots in late April 1954 and ensuing weather conditions were favorable for success of pre-emergence treatments. The treatments were as

follows (rates are pounds of active ingredient per acre): SES 2 1/2 pounds plus NP 2 1/2 pounds, CMU 1/2 pound plus SES 4 pounds, Sesin 4 pounds, SES 4 pounds, MCP form of SES 4 pounds, and Natrin 4 pounds. On July 13 CMU 1/2 plus SES 4 showed 97 per cent weed control. SES plus NP reduced weed stands 88 per cent. The SES, Sesin, Natrin, and MCP form of SES all provided about 80 per cent weed control. No injury was noted in any treatment. With the exception of the CMU plus SES area, all plots were clean weeded and resprayed in mid-July. On November 13 SES plus Alanap showed 69 per cent weed control followed by Natrin 63 per cent, MCP Crag 57 per cent, Sesin 49 per cent, and SES 35 per cent. In 1955, the plants which had received the NP plus SES, CMU plus SES, and SES alone were again treated in late April. On June 2 the weed control was as follows: CMU plus SES 92 per cent, NP plus SES, 73 per cent, and SES, 46 per cent.

Growth measurements were made on several of the above species on July 13, 1955. For example, there was no injury to Douglas fir, Austrian pine, or Black Hills spruce from the mixtures of CMU or NP with SES, or with SES alone, following two years of treatment. A similar experiment begun in April 1955 included several additional species. Growth measurements taken in mid-summer revealed no injury to White spruce, Scotch pine, and Concolor fir. The only injury observed in all of the work cited above was a slight stunting and burning of Red cedar following three treatments with the SES plus NP mixture during two seasons. Mixtures of herbicides such as CMU or NP with SES offer promise of better control of more weed species over a longer period of time. (Department of Horticulture, University of Wisconsin, Madison, Wisconsin).

Control of Brush on Rangeland and Pastures

Harry M. Elwell

Summary

Abstracts on this subject were received from cooperators in Minnesota, Missouri, and Nebraska. The woody species studied were prickly ash, oak, hickory, and buckbrush (western snowberry).

Buckbrush in Nebraska was successfully controlled with 1 pound per acre of 2,4-D isopropyl ester in water solutions applied annually on May 14, 21, and 28 for four successive years. An amine formulation of 2,4-D at the same rate was considerably less effective. The amine and ester preparations of this herbicide at 2 pounds per acre, applied June 28, gave slightly greater control of the buckbrush than the lighter amount on the same date. However, the higher rate of both formulations was not as effective as the 1 pound per acre of 2,4-D ester applied during May. Annual mowing caused considerably less reduction in the number of buckbrush plants than the treatments with 2,4-D.

This plant was also satisfactorily controlled in Minnesota with aminotriazole (3-amino-1,2,4-triazole) at 2 pounds of commercial product in 100 gallons of water, applied as a single foliage application in June and July.

Very good control of prickly ash was also obtained with aminotriazole at 2 pounds per 100 gallons of water, applied as a wetting, single foliage spray on June 30. This ash was found to be more susceptible to 2,4,5-T butoxy ethanol ester than to 2,4,5-trichlorophenoxypropionic acid in ester formulations.

Basal bark treatments were satisfactorily made, using a trigger-type hand gun on hickory and oak trees having a stem diameter of 6 inches or less. The low volatile ester formulation of 2,4,5-T acid in No. 2 diesel oil gave better control of both species than when the chemical was mixed in a 50 percent emulsion of oil and water.

Abstracts

Rates for basal handgun method of brush control. Larson, R. E. Studies were made in 1954 and 1955 to determine the proper herbicide rate for basal handgun applications for brush control. The treatments applied in 1954 were described in the 1954 NCWCC Research Report along with the first-year defoliation attributable to each. The 1955 treatments included herbicide rates of 4, 5, 6, 7, 8, 9, and 10# ahg oil and 5, 6, 7, 8, and 9# ahg 50% oil-water emulsion. The treatments were applied in February and March, 1955. The species included hickory (*carya spp.*) and oak (*quercus spp.*). The stem diameters ranged from 1/2" up to 6" with the average being about 2-1/2". 2,4,5-T propylene glycol butyl ether ester was used for all treatments. No. 2 diesel oil was used as carrier. The treatments were applied with a tractor-mounted sprayer equipped with a trigger-type handgun. A #6 (.0935") orifice was used at a pressure of 30 psi. Sufficient solution was applied to the lower 12 inches of each stem until some runoff was noted.

The second-year defoliation results of the 1954 treatments show no difference in the 5# and 10# rates in oil in that the defoliation was 94.7% and 95.6%, respectively. The 5# rate in emulsion was significantly poorer with 70.9% defoliation. The first year results of the 1955 treatments show no significant differences for all of the herbicide rates. All treatments gave 93-98% defoliation. There was a difference in carriers with the 50% emulsion giving significantly less defoliation

than did the oil carrier. (Contribution of Farm Machinery Section, Agricultural Engineering Research Branch, U.S.D.A., Columbia, Missouri.)

Effect of mowing and spraying with 2,4-D on buckbrush (Symphoricarpos occidentalis, Hook). McCarty, M. K. Plots 10 x 30 feet were established in a pasture near Lincoln in 1951.[1] The amine salt and isopropyl ester of 2,4-D were compared on the following five dates, May 14, 21, and 28, June 28, and July 16, with mowing also included on the May dates. The buckbrush was in full leaf with regrowth shoots 4 to 10 inches long by the earliest treatment date. The materials were applied with a tractor sprayer in 32 gal. of water per acre. Results given in the following table show effect of four years' treatment, 1951 to 1954, inclusive, except as indicated:

Treatment and date	Percent Reduction in Stand				
	May 14*	May 21	May 28	June 28	July 16
Mowing	55	50	35		
2,4-D amine 1 lb.	60	58	42	55	15
2,4-D ester 1 lb.	95	95	88	50	20
2,4-D amine 2 lb.				80	
2,4-D ester 2 lb.				90	

*May 14 treatment was not applied in 1951 because of weather conditions.

Good control is indicated for the 2,4-D ester at the earlier dates and with the 2 lb. rate in June. The amine salt did not give much better reduction than the four years of mowing in this test. No treatments were made in 1955 and inspection in September, 1955, showed many of the remaining plants in the amine plots had set seed while the plants in the mowed plots had not regained much vigor and no seed had been set this year. In the earlier ester plots, only a few very small shoots remained. The July plots showed only moderate reduction in vigor as compared to the check. Recovery in this one year of no treatment had been enough to allow a fair seed crop. [1] Experiment set up and carried through 1952 by Dr. D. L. Klingman, Field Crops Research Branch, ARS, now at Columbia, Missouri. (Contribution of the Field Crops Research Branch, ARS, U.S.D.A., and the Nebraska Experiment Station, Cooperating.)

Approved for publication.

Effect of Amizol (3-amino-1,2,4-triazole) on buckbrush (Symphoricarpos occidentalis). Melander, L. W. Two plots of buckbrush, one in Grant County, Minnesota, and the other in Blue Earth County, Minnesota, treated July 21 and June 30, 1954, respectively, with a foliage spray of 2 pounds of Amizol in 100 gallons of water solution, appeared killed in August, 1955. In the first plot, one small cane (apparently missed) had survived. In the treated areas, there were no sprouts from the rhizomes over one year after treatment. However, outside of the treated area of the first plot, there were two small "white" clusters of new growth about 8 inches tall. This indicates that the Amizol had been translocated through the rhizomes. (Contributed by the Agricultural Research Division, American Chemical Paint Company, Ambler, Pennsylvania.)

Effect of Amizol (3-amino-1,2,4-triazole) on prickly ash (Xanthoxylum americanum). Melander, L. W. On June 30, 1954, a 300-foot strip of fence-row almost completely infested with prickly ash in Blue Earth County, Minnesota, was treated with a concentration of 2 pounds of Amizol in 100 gallons of water solution applied as a foliage spray. During the remainder of the summer of 1954, there was no apparent effect of the treatment except for a slightly lighter color of green of

the foliage. On June 2, 1955, all of the foliage had developed but was completely devoid of chlorophyll. Some of the plants had died over the winter. Shoots coming up at some distance from the originally treated plants also had white foliage. Later in the season, these albino leaves dried up and sloughed off. On September 20, 1955, over 80 percent of the prickly ash canes were dead and many appeared to be dying. (Contributed by the Agricultural Research Division, American Chemical Paint Company, Ambler, Pennsylvania.)

Comparative effects of butoxy ethanol ester of 2,4,5-T phenoxy acetic acid and butoxy ethanol ester of 2,4,5-T phenoxy propionic acid on prickly ash (Xanthoxylum americanum). Melander, L. W. On June 29, 1954, in Blue Earth County, Minnesota, two large colonies of prickly ash, about 25 feet in diameter, were treated with butoxy ethanol ester of 2,4,5-trichlorophenoxyacetic acid and butoxy ethanol ester of 2,4,5-trichlorophenoxypropionic acid, respectively. In each plot, a concentration of 2 pounds acid equivalent in 100 gallons of water emulsion was used and applied as a foliage spray. The following day, two additional colonies of about the same size were given the same treatment. Fifteen months later, September 20, 1955, there was almost a complete kill in the plots treated with butoxy ethanol ester of 2,4,5-T acetic acid; and, on the other hand, the plots treated with the butoxy ethanol ester of 2,4,5-T propionic acid had practically recovered. These results indicate that butoxy ethanol ester of 2,4,5-T acetic acid will kill prickly ash in pastures. (Contributed by the Agricultural Research Division, American Chemical Paint Company, Ambler, Pennsylvania.)

CONTROL OF BRUSH ON RIGHTS-OF-WAY

R. H. Beatty

Summary

Eight abstracts were received, and reported on results with several new chemicals.

Amizol (3-amino-1,2,4-triazole) used at 4 lb/A was reported to have killed a heavy infestation of poison ivy (Rhus toxicodendron L) with no effect on Virginia creeper (Parthenocissus quinquefolia) present in sprayed area. Amizol used at 6 lb. per 100 gallons of water gave good control of several oak species and cherry (96% or better). When used at 4 lb. per 100 gallons of water, Amizol gave good control (81%) of northern pin oak and red oak but only 54% control of white oak and 47% control of black cherry.

A comparison of the butoxy ethanol esters of 2,4-D propionic, 2,4,5-T propionic, MCP propionic, and 2,4,5-T acetic acids applied to cherry and several oak species at 4 lb. acid equivalent per 100 gallons of water showed that 2,4-D propionic was more effective on the oaks than MCP propionic and more effective on white oak than 2,4,5-T propionic or 2,4,5-T acetic. 2,4,5-T acetic was the most effective chemical on black cherry. MCP propionic showed marked failure to inhibit sprouting at root collar.

When 2,4,5-T propionic was applied at 2 lb/A in 15 imperial gallons of water by an air blast machine, its effect was most noticeable on oak species.

2,3,6-trichlorobenzoic acid was applied to mixed brush in June, 1955, at rates of 2 lb/A in 15 imperial gallons of water and 4 lb/A in 30 imperial gallons. Late fall examination indicated top growth dead or dying on all species except dogwood.

CMU controlled scrub oak in Oklahoma when sprayed on the soil from the tree trunk out 6' or when applied as a narrow band 6'-10' from the tree trunk. Where CMU was applied to the soil around oak trees at rates of 5-20 lb/A, observations made 2 years later indicated 5 lb/A not satisfactory; the 10, 15, and 20 lb. rates destroyed all trees.

CMU was studied to determine its effectiveness on native grasses. In Oklahoma 5 lb/A had very little effect on native grasses; 10 lb/A reduced stands 50 to 60%. Hay yields indicate that although many native grasses are killed, the grasses that survive have little competition, and production is higher than expected.

Abstracts

Controlling scrub oak with CMU. Elder, W. C. During the months of March, August and October, 1953, CMU in water was sprayed on the ground in a wooded area composed primarily of post oak (Quercus stella) and blackjack (Quercus marilandica). Rates used were 5, 10, 15, and 20 lb/A in 50 gallons of water. Observation made in October, 1955, showed 5 lb/A plots to have many dead trees, but the kill was not complete and not satisfactory. The 10, 15, and 20 lb/A destroyed all oak trees and no resprouting had occurred. Many other species of trees were still living in plots where the oaks were apparently completely killed. In December, 1954, CMU was applied

on the soil under large post oak and blackjack trees (12" to 18" in diam.). Rates for each tree were 25, 37, 50 and 75 grams CMU. Under one group of trees the chemical was applied as a spray on the soil from the tree trunk out to 6 ft., and in still another the spray was applied as a narrow band 6 to 10 ft. from the tree trunk. All trees were apparently dead by October, 1955, regardless of treatment. Some of the trees were killed early in the growing season and others retained their leaves until late summer. Many other oak trees of all sizes nearby were killed or injured. (Contribution of Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma).

Effect of CMU on native grasses. Elder, W. C. CMU was applied on a native grass meadow having a good stand of mixed grasses. Grass species present were big bluestem (Andropogon gerardi), little bluestem (Andropogon scoparius), Indian (Sorghastrum nutans), and switch (Panicum vergatum). Duplicate plots were sprayed in April when grass started growth. CMU was applied in 40 gallons of water per acre at the rate of 5, 10, 15, and 20 lbs. per acre. The same tests were repeated in June after the grass had reached good size and was growing rapidly. 5 lb/A of CMU affected the native grasses very little. 10 lb/A reduced stands 50 to 60%. 15 and 20 lb/A injured the grasses severely but some large bunches remained alive after these treatments. All small seedling grasses, both annual and native, were destroyed by the lower rates. Hay yields from the plots indicate that although many native grasses are killed, the large bunches which survive have little competition, and production is higher than expected. In another study in 1953, where CMU was used to kill scrub oak, the annual grasses and native grass seedlings were surviving in 1955. (Contribution of Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma).

Comparison of 2,4-D propionic, 2,4,5-T propionic, MCP propionic, and 2,4,5-T acetic on mixed brush. Meyers, W. A., Turner, M. B., Pintcke, I. Application of the various materials was made on mixed brush during July, 1954. All plots were sprayed at the rate of 4 lb. acid equivalent butoxy ethanol esters per 100 gallons of water. All plants were sprayed to run-off with both leaves and stems thoroughly wetted to ground line. Brush averaged 4 to 6 feet in height. Plots were located near Newaygo, Michigan. Results taken in September, 1955, were as follows:

	Treatment			
Species	2,4-D propionic % kill	2,4,5-T propionic % kill	MCP propionic % kill	2,4,5-T Acetic % kill
White oak	99	82	87	89
Red; N. pin oak	91	91	82	88
Black cherry	90	76	90	99

Although all treatments gave excellent control of treated woody plants, MCP propionic showed a marked failure to inhibit the growth of sprouts appearing at the root collar of treated plants. Sprouts of the MCP propionic plot were definitely larger and more vigorous than those on the other treatments. (Contribution of American Chemical Paint Company, Agricultural Chemicals Division, Ambler, Pa.).

The effectiveness of Amizol on mixed brush. Meyers, W. A., Turner, M. B., Pintcke, I. Application of Amizol (3 amino-1,2,4-triazole) was made on mixed brush in July, 1954. Rates used were 4 and 6 pounds Amizol

per 100 gallons of water. All plants were sprayed to the point of run-off with no attempt being made to spray the ground. Brush was 4 to 6 feet in height. Plots were located near Newaygo, Michigan. RESULTS: Plot observed during August, 1955, indicated that better control was achieved with the 6 pound rate than the 4 pound rate.

Species	4 pounds aminotriazole per 100 gallons water % Kill	6 pounds aminotriazole per 100 gallons water % Kill
Northern Pin Oak and Red Oak	81%	97%
White Oak	54%	99%
Black Cherry	47%	96%

(Contribution of Amer. Chemical Paint Co., Agr. Chemicals Div., Ambler, Pa.).

2,3,6-Trichlorobenzoic acid as a foliage spray. Playfair, Lloyd. Applied in June, 1955, at rates of 2 lb/A in 15 imperial gallons of water and 4 lb/A in 30 imperial gallons of water on mixed species of woody growth. Burr oak, white poplar, ash, hawthorne, willows, wild rose, hazel, and dogwood were present. Application was made with an air blast machine to 1/2 A plots near Winnipeg. Late fall examination indicated top growth dead or dying on all species except dogwood. Effect most noticeable on oak, willows, and hazel. Higher rates and volume gave better coverage and penetration but this could have been due to favorable wind condition. Plots will be examined for regrowth and final results in 1956. (Contribution of the Manitoba Power Commission, Winnipeg, Manitoba).

2 (2,4,5-Trichlorophenoxy) propionic acid (Kuron) as a foliage spray). Playfair, Lloyd. Applied by an air blast machine to approximately 4 acres of mixed growth in west central Manitoba at 2 lb/A in 15 imperial gallons of water on the 20th of August, 1954. Burr oak, white and black poplar, willows, chokecherry and pincherry were present. Examined in August, 1955. Effect on oak most noticeable, some trees had odd deformed leaf, no regrowth at base. Very little effect on balance of growth, poplar growth quite vigorous. Similar growth in nearby location commercially sprayed with same rate of ester of 2,4-D at same volume gave much better control of all growth with exception of oak and on this species, 2,4-D almost, but not quite, as effective as chemical under test (Kuron). (Contribution of the Manitoba Power Commission, Winnipeg, Manitoba).

3-Amino-1,2,4-triazole on poison ivy (Rhus toxicodendron L.). Robinson, E. L. and Willard, C. J. Aminotriazole was applied on June 7, 1955, to a heavy infestation of poison ivy at the rate of 4 lb/A. By June 24, 1955, the above ground parts were dead, and no sprouts have appeared to date (October 20). The aminotriazole had no apparent effect on five-leaved ivy or Virginia creeper (Parthenocissus quinquefolia) present in the treated area. (Contribution of the Ohio Agricultural Experiment Station).

Effect of Amizol (3-amino-1,2,4-triazole) on poison ivy (Rhus radicans) Melander, L. W. One heavily infested plot of poison ivy in Grant County, Minnesota, was treated on July 21, 1954, with a concentration of 2 pounds of amizol in 100 gallons of water solution applied as a foliage spray. By August 12, 1954, the poison ivy appeared completely dead, and one year later on August 25, 1955, there was no regrowth indicating a complete kill of the roots and rhizomes. This appears to be a simple method of killing this poisonous plant. (Contributed by the Agricultural Research Division, American Chemical Paint Company, Ambler, Pa.)

CONTROL OF BRUSH IN FORESTS, TREE PLANTATIONS AND FARM WOODLANDS

Henry L. Hansen

Summary

Relatively few abstracts were received for the 1955 field season although it is felt that interest in the use of herbicides for forest brush control continued at a very high level. This was particularly true in the case of aerial applications of herbicides to forest brush in the Lake States. However, much of this activity appears to have passed into a stage of field scale testing by pulp and paper companies and public forestry agencies with relatively little systematic analysis and reporting of the results.

In Minnesota, results after four years indicate a high level of recovery by Labrador Tea, an important northern swamp shrub, following both 2,4-D and 2,4,5-T applications except at extremely high rates of application. In 1955 trials for the control of northern swamp grasses, Dalapon applied in mid-June was found to be effective in preparing grassy swamps for reforestation but was found to be injurious to black spruce if applied following planting.

One abstract was received reporting tests of full strength 2,4-D and 2,4,5-T esters and amines on red and white oaks in Michigan. The most effective treatment of those tested was found to be 2,4-amine applied in frill girdles at the rate of ½ to 2 milliliters per inch of diameter of the trees.

Abstracts

Removal of undesirable trees in timber stand improvement. Nichols, J. M. This report covers the effectiveness of treatments on which costs were reported in the 1954 report. Undesirable and poorly-formed trees including post oak, black oak, blackjack oak, and hickory were treated on 1-acre plots in May, 1953, October, 1953, and February, 1954. Approximately 75 trees were treated on each plot.

Percent of treated trees in each condition class* in September, 1955

Treatment (Seasons Combined)	4 - 8 in. dbh				10 in. dbh and larger			
	A	B	C	D	A	B	C	D
Axe girdle (no chemical)	0	7	41	52	0	9	11	80
2,4,5-T, 8 lbs AHG kerosene high frill	1	2	22	75	0	6	0	94
2,4,5-T, 8 lbs AHG kerosene low frill	1	1	32	66	0	34	0	66
2,4,5-T, 8 lbs AHG water low frill	29	8	11	52	45	9	1	45
Sodium arsenite (Atlas A) low frill	0	0	20	80	0	3	3	94
Sodium arsenite (Atlas A - half strength) low frill	0	3	40	57	0	0	3	97
Sodium arsenite (Atlas A - half strength) high frill	0	3	62	35	6	0	13	87
Ammate, 4 lbs/gal water, low frill	3	8	28	61	24	12	3	61
CMU, 1 tablespoon per inch of dbh, applied to soil around base of tree	35	7	0	58	17	29	0	54

Seasons (treatments combined)

Summer	1	0	14	85	3	9	3	85
Fall	13	6	31	50	13	13	4	70
Winter	2	7	35	56	30	16	2	52

*Condition classes: A-tree apparently unaffected, B-partial top-kill, C-complete top-kill with basal sprouts, D-complete top-kill without basal sprouts.

The CMU soil treatment resulted in the kill of an occasional desirable tree located near a treated tree. When applied in frills, CMU was almost totally ineffective. (Contributed by Department of Forestry, University of Missouri)

Control of Labrador tea and leatherleaf by foliage spraying with 2,4-D and 2,4,5-T. Roe, Eugene I. A fourth-year examination of small plots near Cohasset, Minnesota, foliage-sprayed in late October, 1950, with the propylene glycol butyl ether ester of 2,4,5-T in fuel oil at the rates of 7, 16, 31, and 65 lb./A, showed that Labrador tea (Ledum groenlandicum) made a 46% recovery on the lightest application, 8% on the second, 13% on the third, but was completely killed out where the heaviest application was made. Where fuel oil alone was used, however, recovery of the shrub was complete.

Recovery was also very high on both series of plots where this herbicide and 2,4-D were applied in water solution but at somewhat lower rates (5, 9, 18, and 38 lb./A approximately) in mid-July of that year. Of these, the 2,4-D plots showed the better results, but where the two lightest applications were made there are now more stems than before spraying. Recovery on the two heaviest applications was 75% and 50% respectively.

The associated shrub, leatherleaf (Chamaedaphne calyculata), as earlier reported (Roe, 8th Res. Rept., p. 162), proved much easier to kill, excellent control (11% recovery) being obtained with as low as 5 lb. 2,4-D/A in water. (Lake States Forest Experiment Station, Grand Rapids, Minnesota, in cooperation with Dow Chemical Company)

Herbicides show promise in controlling grass competition on peat land. Roe, Eugene I., and Gaylord, George T. Exploratory tests of three chemicals were made on an abandoned peat field near Rabey, Minnesota, to determine their possibilities in controlling bluejoint (Calamagrostis canadensis), wire grass (Carex spp.), and wool grass (Scirpus cyperinus), so as to permit restocking the land with black spruce. The chemicals were: (1) the sodium salt of 2,2-dichloropropionic acid (Dalapon), (2) aminotriazole (Weedazol), and (3) the sodium salt of polychlorobenzoic acids. Two concentrations of each were applied in 30 gal. of water solution /A to replicated 1/80-acre plots at 4 periods of the growing season: in mid-May after growth had begun, in mid-June at the peak of growth, in mid-July when growth was about complete, and in mid-September after the first killing frost. Concentrations were: 2,2-dichloropropionic acid, 10 and 30 lb./A; aminotriazole, 6 and 12 lb./A; and sodium polychlorobenzoates, 2 and 8 lb./A. All were put on by means of pressure-operated potato sprayers.

Cultivation, commonly done after treatment of grass with herbicides, was not feasible here because the site was too wet. One plot of each treatment was planted with thirty 2-1 black spruce in May (after the May spraying), the other replication with a like number of spruce in September (also after treatment).

Results at the end of the first season show that only the 2,2-dichloropropionic acid had much effect in reducing the density and height of these perennial "grasses." The aminotriazole had a dwarfing effect and reduced density, but not to the striking degree shown by the former chemical. Of the three earlier spraying dates (the September application was too late to show any results the first year), mid-July gave the best results, no recovery having been made by the "grasses" sprayed with 2,2-dichloropropionic acid at that time. Mid-June was almost as good, but the May-sprayed "grasses," although retarded for a month or so, by fall showed about a third of the density and about two-thirds the height of those "grasses" on the surrounding unsprayed area. Of the two concentrations, 30 lb. was better than 10 lb., but not enough better to warrant the additional cost of material.

The aminotriazole and sodium polychlorobenzoates, however, reduced both density and height of the associated broadleaved herbs to a much greater degree than the 2,2-dichloropropionic acid. All three chemicals proved injurious to the black spruce when applied after planting.

Judging from these early results, 2,2-dichloropropionic acid has considerable possibilities in preparing grassy swamps for reforestation; further tests of this chemical and also of aminotriazole seem warranted. (Lake States Forest Experiment Station, Grand Rapids, Minnesota, and Minnesota Conservation Department, Division of Forestry, Hill City, Minnesota, in cooperation with Dow Chemical Company, American Chemical Paint Company, and Hooker Electro-chemical Company)

Effects of undiluted 2,4-D and 2,4,5-T in cut surfaces on oak in Lower Michigan. Westing, Arthur H. Tests using undiluted amines and esters of 2,4-D and 2,4,5-T in cut surfaces to kill red and white oaks were installed in Lower Michigan in September, 1954 and duplicated in April, 1955. Using 4 pounds acid equivalent per gallon, 4 commercial herbicides were applied at 3 dosage rates to 4 kinds of breast-high cuts. Each of these 48 treatments was applied to at least 5 red oaks and 5 white oaks ranging from 6 to 10 inches in diameter at breast height. The herbicides, dosages, and kinds of cut surfaces were:

Herbicides--propylene glycol butyl ether esters of 2,4-D and of 2,4,5-T, alkanalamine salt of 2,4-D, and triethyl amine salt of 2,4,5-T.

Dosage rates--½, 1, and 2 milliliters per inch of diameter.

Cut surfaces--complete frill girdles 1½ inches deep, complete frill girdles ½ inch deep, partial frill girdles (cuts 4 inches wide and 4 inches apart) 1½ inches deep, and partial frill girdles ½ inch deep.

In August, 1955 the treated trees were examined for both top kill and sprouting. The 2,4-D ester was not effective except in deep complete frill girdles at rates of 1 and 2 milliliters per inch of diameter. The amine of 2,4-D, with any of the rates of dosage, killed all trees with complete frill girdles and as many as 60 to 100 percent of those partially girdled. Both the ester and the amine of 2,4,5-T were effective only in complete frill girdles. Of the trees top-killed by the September treatments, 1/3 sprouted compared to ½ of those treated in April. Twice as many white oaks sprouted as red oaks. Trees with deep girdles sprouted more than those with shallow ones. The conclusion is that the undiluted amine of 2,4-D, applied in frill girdles at dosages of ½ to 2 milliliters per inch of diameter, is more effective than the other hormone-type herbicides. (Lake States Forest Experiment Station, East Lansing, Michigan.)

CHEMICAL DRYING AND PRE-HARVEST WEED CONTROL

Summary

W. M. Phillips

The four abstracts received reported results on four different crops. PP-dibutyl-N, N-diisopropylphosphinic amide at 2 and 4 pounds per acre reduced the moisture content of flax significantly.

DNBP, magnesium chlorate, PCP, and sodium chlorate-sodium pentaborate were most effective in reducing the moisture content of Kentucky bluegrass seed. After 130 hours the seed was nearly dry enough for safe storage. Ten days (250 hours) after application several of the treatments had reduced moisture content well below the untreated plots.

Of the chemicals tested on sudangrass, PCP at 6 quarts per acre was the most effective desiccant. Magnesium chlorate at 6 quarts per acre used alone and with ½ pound of amizol reduced the moisture content of the seed nearly as much as PCP.

Magnesium chlorate at 2½ to 5 pounds per acre gave defoliation and desiccation of field beans. Best results were obtained when the chemical was applied after 90 percent of the bean leaves were yellow. The higher rate was necessary when a heavy growth of weeds was present. Addition of a wetting agent improved results.

Abstracts

Pre-harvest spraying of flax. Jordon, L. S. and Dunham, R. S. PP-Dibutyl-N; N-Diisopropylphosphinic Amide at 2 and 4 lb/A in 40 gal. of water was sprayed on mature Marine flax August 19.

Results

Rate	Moisture in %			% Germination
	Flax seed		Weed seeds	Flax seed
	Aug. 22	Aug. 31 (after a rain)	Aug. 31	
0	14.6	26.9	47	52
2	11.3	16.0	36	55
4	12.4	14.5	33	62
LSD (5%)	2.1*	5.3**	16	

* F significant at 5% level.
** F significant at 1% level.

(Contributed from Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3445, Sci. Jour. Series, Minn. Agric. Expt. Station).

Chemical desiccation of Kentucky bluegrass (Poa pratensis) being grown for seed production. Peterson, W. F. and W. G. Monson Chemical treatments were applied in triplicate to square rod plots using a four nozzle boom applying the solution at a rate of 20 gallons per acre. Treatments were applied on June 10 at which time the moisture content of the seed was approximately 35%. Seed for moisture tests was harvested by hand stripping at intervals as indicated in the following table:

Treatment	Rate/A	Carrier	Moisture percent at: 34 hrs.	80 hrs.	130 hrs.	250 hrs.
1. DNBP	1 pt.	diesel fuel	29.2	17.6	14.1	11.9
2. DNBP	2 pts.	diesel fuel	28.3	15.7	11.9	8.5
3. PCP	2 qts.	diesel fuel	29.2	18.7	15.0	9.3
4. PCP	4 qts.	diesel fuel	28.3	17.8	12.8	8.0
5. Magnesium chlorate	2 qts.	water	31.0	15.1	13.4	7.8
6. Magnesium chlorate	4 qts.	water	28.5	17.7	12.3	12.4
7. Phillips 713	4 qts.	diesel fuel	30.4	20.0	15.2	10.6
8. Phillips 713	8 qts.	diesel fuel	30.7	19.0	15.0	8.3
9. Amino triazole	1/2 lbs.	water	30.0	23.6	20.0	18.2
10. Magnesium chlorate + Amino triazole	2 qts. 1/2 lbs.	water	28.9	18.0	14.1	11.1
11. Sodium chlorate - sodium pentaborate	10 lbs.	water	31.4	18.8	12.9	8.2
12. Sodium chlorate - sodium pentaborate	20 lbs.	water	29.1	15.9	13.1	8.0
13. Sodium chlorate - sodium pentaborate + Amino triazole	10 lbs. 1/2 lbs.	water	31.2	18.2	14.7	8.9
14. Check			26.7	24.3	13.5	13.4

For the sake of comparing the effectiveness of the above chemicals upon rapidity of drying, it may be noted, that at the end of 80 hours magnesium chlorate (2 qts.), DNBP (2 pts.) and Sodium chlorate-sodium pentaborate (20 lbs.), had reduced the moisture content approximately 50% from the initial moisture. However, from the standpoint of attaining a moisture content suitable for field harvest and storage it is apparent that DNBP (2 pts.), Magnesium chlorate (4 qts.), PCP (4 qts.) and Sodium chlorate-sodium pentaborate (10 lbs. or 20 lbs.) were approaching this limit at 130 hours. It may also be noted that at the end of 250 hours, the seed from untreated plants still carried a moisture content which would not warrant safe storage. (Contribution Department of Agronomy, University of Nebraska, Lincoln, Nebraska).

Chemical defoliation of field beans. Wiltse, M. G. and B. H. Grigsby. Several field applications of magnesium chlorate (Magron) were applied to Michelite field beans to hasten defoliation and drying. Tests were conducted in Huron County in the vicinity of Bad Axe, Michigan between August 26 and October 1, 1955. Magnesium chlorate was applied at 1.25, 2.5, 3.75 and 5.0 lb./A with and without a wetting agent (Dynawet). Applications were made with an airplane sprayer and tractor sprayer at 5 and 18 gal./A, respectively. Excellent defoliation was obtained with 2.5, 3.75 and 5.0 lb./A. Excellent defoliation was obtained with 2.5 lb./A when the bean field was free of weeds and 90% of the bean leaves were yellow; however, beans heavily infested with weeds gave excellent defoliation only with the higher rates. Addition of a wetting agent increased the desiccation, defoliation and regrowth control of the beans and desiccation of the weeds. Defoliation was less efficient when the treatments were applied to beans with 15% or more green leaves. No appreciable difference in defoliation occurred between ground and air applications. The moisture contents on different dates after spraying for one test are:

Moisture Content of Field Beans Sprayed on September 8

Date tested	Percent Moisture: Magnesium chlorate 2.5 lb./A %	Percent Moisture: Untreated %
September 10	29.0	31.3
September 12	23.2	29.0
September 16	22.2	26.2

In another test beans treated with 3.75 lb./A had 14.2% moisture content a week after treatment compared to 17.9% for the untreated plot. No bean discoloration was obtained with any treatment. (The Dow Chemical Company, South Haven, Michigan and Michigan Agricultural Experiment Station, East Lansing, Michigan.)

Pre-harvest desiccation of a sudan grass seed field. Shafer, N. E. Two acre plots of Piper sudan grown in 40" rows were treated with six different chemical treatments. All plots were sprayed by airplane using 7.5 gallons of spray solution per acre. Treatments were applied September 15 at a time when the crop would normally be windrowed. Maximum daily temperatures for the five days following treatment ranged from 94 to 100° F. One inch of rain fell on the 18th. A severe wind and dust storm occurred on the 20th. Moisture samples and shattering counts were taken September 23rd. Chemical treatments, moisture percent of the seed, and shattering counts were as follows:

Treatments	Rate/A. & carrier	Moisture percent	Shattering counts seeds/ sq. foot
1. Pentachlorophenol	6 qts. in diesel fuel	14.87	38
2. Magnesium chlorate	6 qts. in water	15.30	74
3. DNBP (Dow General)	3 pts. in diesel fuel	18.80	102
4. Sodium chlorate - sodium pentaborate	20 lbs. in water	18.80	75
5. Phillips 713	8 qts. in diesel fuel	18.32	83
6. Magnesium chlorate + Amizol	6 qts. in water 1/2 lb.	15.09	70
7. Untreated		29.45	53

In this test, PCP gave the greatest reduction in seed moisture and likewise showed even less shattering than the untreated check. Regrowth was apparent in most of the treatments one week after treatment. The amizol treated plot showed complete inhibition of regrowth. (Contribution of Department of Agronomy, University of Nebraska, Lincoln, Nebraska.)

New Herbicides

Summary

W. C. Dutton

A total of 46 abstracts on 20 of the materials classed as new herbicides was received. The results presented in these abstracts are here indicated briefly and without interpretation. Full information can be obtained by reference to the abstracts under the weed or crop concerned.

Four amino acid derivatives (1 report) of 2,4,5-T were tested on mesquite seedlings. The three forms, (L), (DL), and (D) were decreasingly effective in that order but only one, the (L) leucine, approached the standard 2,4,5-T in activity. Sodium 2-methyl-4-chlorophenoxyethyl sulfate (Methin) (1 report) at 4 lbs. caused no injury to strawberry plants. One application of dichlorophenyl methylbutylurea (1 report) at 4 lbs. in one application apparently gave poor control of crabgrass in bluegrass. Dichlorophenoxy propionic ethanol (1 report) used pre-emergence at 1 lb. on canning peas did not give satisfactory results. 4-(2,4-Dichlorophenoxy) butyric (2 reports), 4-(2,4,5-trichlorophenoxy)butyric (1 report) and 4-(2-methyl-4-chlorophenoxy)butyric acids (3 reports) were used on legumes. On birdsfoot trefoil they show promise but the MCPB was more injurious than the others. The MCPB amine on alfalfa in one trial caused little or no injury and controlled lambsquarter and pigweed but not ragweed. In another study 2,4-DPB at 2 lbs. caused no injury to alfalfa and red clover and only slight to trefoil. MCPB was not as safe on alfalfa. Chloroacetyl morpholine (3 trials) caused no injury to potatoes (pre-emergence) and gave less than 50% weed control; on sugar beets it caused no injury to beets and was ineffective and was unsatisfactory in corn.

Sodium 2,2,3-trichloropropionate (6 reports) gave no control of Bermuda grass in turf, poor results on quack or couch grass and on Setaria was equal to or slightly better than dalapon in pre-emergence treatment and inferior in post-emergence. Wild oats were not controlled by 6 lbs. On sugar beets (post-emergence) it gave good grass control in two cases but was not quite equal to TCA and dalapon in one of the tests.

Sodium N-methyl dithiocarbamate dihydrate (1 report) used for control of Bermuda grass in a lawn gave 72% control but incomplete kill resulted from lack of depth penetration. (1-chloropropyl-2) N-(3-chlorophenyl)carbamate (N-5521) (2 reports) was ineffective pre-emergence on onions, was good for broadleaves and fair for grasses at 1-leaf stage and at layby was good on purslane but unsatisfactory on grasses. There was no crop injury. Used pre-emergence on potatoes it caused no injury but did not give satisfactory weed control. (1-chloropropyl-2)N-(3-methylphenyl) carbamate (N-5522) (7 reports) gave no control of foxtail and less than 70% for wild oats; was unsatisfactory pre-emergence on canning peas; and potatoes; on onions was not effective in any one of three stages but caused no crop injury; on corn pre-emergence at 8 and 12 lbs. was equal to 1 1/2 lbs. 2,4-D for grasses and better for broadleaves; on soybeans gave poor broadleaf and fair grass control

(not equal to 5523) without injury and gave satisfactory grass control in sugar beets but not equal to 5523. 2-Chloroethyl N-(3-methylphenyl)carbamate (N-5523) (6 reports) gave less than 65% control of wild oats and poor for foxtail but without crop injury; in canning peas results were not satisfactory; on onions was ineffective at three stages but caused no crop injury; on potatoes on muck gave poor results on broadleaves but 74% of total weeds with no yield reduction; in soybeans grass control was fair (better than 5521 and 22) and produced satisfactory grass control in sugar beets.

Tris-(2,4-dichlorophenoxyethyl)phosphite (EH3Y9) (7 reports) for crabgrass in bluegrass turf at 4 lbs. (3 applications) was fairly good at one month, but was poor by August; with green beans pre-emergence, there was good weed control but severe injury to the beans; on canning peas 6 lbs. pre-emergence gave 60-75% control without excessive injury; a pre-emergence application on onions was ineffective and reduced yield, at 1-leaf stage was ineffective but no crop injury and at layby purslane was controlled by 4 lbs. and grasses by 8 lbs. and with slight yield reduction; on potatoes on muck broadleaf control was fair and grasses uncertain; with soybeans weed control was good but injury ranged from slight to severe with 2, 4 and 6 lbs. and with sugar beets there was fair broadleaf and good grass control.

2-Chloro-4,6-bis(dimethylamino)-S-triazine (Geigy 444) (13 report) used on several crops as here indicated.

Corn - layby - 2 and 7 lbs. not satisfactory
Corn - pre-emergence - 2, 4 and 6 lbs. less than 50% control of foxtail and pigweed - no injury to corn
Corn - pre-emerge. - 4 lbs. less effective than 1 1/2 of 2,4-D, 8 and 12 lbs. equal to 2,4-D
Corn - pre-emerg. - 18 lbs. promising
Soybeans - pre-emerg. - 4, 8 and 12 lbs. - 82% weed control
Soybeans - pre-emerg. - 6, 12 and 18 lbs. - gave good weed control - severe injury
Canning peas - pre-emerg. - 4, 8 and 12 lbs. - 8 lbs. gave 85% weed control without excessive injury
Canning peas - post-emerg. - 2 and 4 lbs. - fair for broadleaf - poor for grasses - not satisfactory
Snap beans - pre-emerg. - 8 lbs. - did not control grasses, 88% of broadleaves - no injury to crop
Onions - pre-emerg. - 4 and 8 lbs. - poor for grasses, promising for broadleaves, no crop injury
one-leaf stage - 4 and 8 lbs. - fair grass and good broadleaf control, no crop injury
layby - 4 and 8 lbs. - good on purslane, poor on grass, reduced yield
Potatoes on muck - pre-emerg. - 4, 8 and 12 lbs. - no control of grasses with 8 lbs., 88% of broadleaves, no injury
Sorghum - pre-emerg. - 2, 4, 6 and 8 lbs. - weed control - 0-0-50-67%, kill of sorghum - 0-54-60-73%
Sugar beets - pre-emerg. - 12 and 18 lbs. - 18 lbs. promising

2,3,6-Trichlorobenzoic acid and tetrachlorobenzoic acid (12 reports). Weeds on muck, pre-emerg. for weeds - 1 lb. or less good on pigweed, purslane, lambsquarters, ragweed, smartweed, wild lettuce. 2 lbs. not good for grasses; for henbit in turf, 4 lbs. - 45% control without spreader, 80% with; mayweed - 8 to 12 in. - 2, 4 and 6 lbs. - 25, 70, 80% control - best of any material used; foliage spray on woody plants - 2 lbs. in 15 gal. airblast application - killed top growth on all species tested except dogwood; on onions post-emerg. - 1/2 lb. over top and directed - slight injury from over top treatment - no yield reduction; on strawberries set one month - 1 and 2 lbs. - severe stunting and runner reduction; canning peas - post-emerg. - 0.2 and 0.3 lb. - no control with 0.2 lb., 60 and 25% control of broadleaves and grasses with 0.3 lb. - no injury to peas; sorghum - pre-emerg. - 1/2, 1, 2 and 4 lbs. - kill of stinkweed and pigweed, 77, 93, 96 and 99% - kill of sorghum, 0, 25, 45 and 98%; corn - pre-emerg. - comparing sodium salt and oil soluble formulation - 1/2, 1, 2 and 4 lbs. oil soluble more effective at lower rates - 1/2, and 1 lb. caused curvature of corn, 2 lbs. stunted and 4 lbs. reduced stand; corn - pre-emerg. - comparing tri- and tetra - 1 1/2 lb. - tetra less active than tri-; corn - pre-emerg. -good at 2 and 3 lbs. - some formulations better than others and sugar beets - 4 leaf stage - 1/2, 1 1/2, 4 and 8 lbs. - excellent weed control but highly toxic to beets. Polychlorobenzoic acid (4 reports). For wild oats, pigweed and foxtail in crops - 1/2 and 2 lbs. - no control of wild oats - none to poor with foxtail - pigweed, poor to fair - no injury to some crops, severe to others; tartarian buckwheat in grain at emergence of grain - 1/2 and 1 lb. - good control at 1 lb. with some and all reduced barley 30 to 60%; corn - pre-emerg. - 1, 2 and 4 lbs. - less effective than 2,2,3-trichlorobenzoic and Canada thistle - 8 lbs. to dense top growth - deformed and eventually killed tops and 50% or more of barley. 3,4-Dimethylbenzoic acid (1 report). Corn - pre-emerg. - 3, 6 and 9 lbs. - results apparently not satisfactory but not definitely stated.

2-Chloro-N,N-diallylacetamide (CDAA) (28 reports). Weeds on muck and fine sand - pre-emerg. - on muck, excellent for grasses, no control of ragweed, poor to good for purslane and poor to fair on pigweed and lambsquarter - on sand, 4 and 6 lbs. failed to control crabgrass; weeds on muck - pre-emerg. - combination 6 lbs. CDAA and 2 lbs. TCB gave excellent control of all weeds and grasses; wild oats and foxtail with 13 crops - pre-emerg. - 2 and 4 lbs. - no control of wild oats and poor for foxtail - no crop injury; Setaria- pre- and post-emerg. 3 and 6 lbs. - good control from pre-emerg., none from post-emergence; for wild oats at several stages - 3 and 6 lbs. - no control; several other tests with wild oats - control ranged from none, fair to excellent with crop injury from none to severe and with indication that moisture relations have important effect on activity. With crops 6 lbs. post-emerg. on onions caused only slight injury, mostly from overtop application; on sweet corn, pre-emerg. - 4 lbs. gave satisfactory weed control and no yield reduction; with green beans 8 lbs. pre-emerg. there was no yield reduction and satisfactory weed control, and in another study 6 lbs. gave unsatisfactory control and no injury; with 3, 6 and 9 lbs. on canning peas control was not satisfactory; in onions 6 lbs. pre-emerg. gave 97% control of grasses, no control of weeds at 2-leaf stage and good grass control at layby; with potatoes on muck

6 lbs. pre-emerg. gave good control of grasses and poor of broadleaves; with soybeans 6 lbs. pre-emerg. in a tolerance test caused no injury, in another 3, 6 and 9 lbs. was generally ineffective, and in a third 4 and 8 lbs. gave 91 and 98% control; three experiments with corn gave (1) 65 to 83% control of foxtail and pigweed with no injury to corn, (2) 4, 8 and 12 lbs. caused no damage to corn with 8 and 12 lbs. being less effective than 1 1/2 lbs. 2,4-D and 4 lbs. much less, and (3) with 3, 6 and 9 lbs. but not of broadleaves, there was satisfactory grass control with this rate; in flax, pre-emerg. 3 lbs. gave good Setaria control and 6 lbs. excellent control of grass and broadleaves and in two experiments on sugar beets results were - (1) 4, 8 and 16 lbs. pre-emerg. gave little control except at 16 lbs. which also injured beets and (2) 3, 6 and 9 lbs. pre-emerg. gave satisfactory grass control at 6 and 9 lbs. but not of broadleaves. Leaching studies in clay soil indicated movement with 2 inches of rain in 24 hours with high activity down to 2 in., moderate in 2 to 3 in. zone and very slight at 3 to 5 in. level.

2-Chloro-N,N-diethyl acetamide (CDEA) (20 reports). For Setaria 3 and 6 lbs. gave no control in post-emergence treatment but 94 and 98% in pre-emergence; two experiments with wild oats gave no control with 3 and 6 lb. at several stages, but a third study gave good to excellent control with 3 and 6 lbs. in pre-plant treatment and fair and good in pre-emergence but thinned grain crops and in a fourth 2 and 4 lbs. pre-emerg. gave no control of wild oats or pigweed and fair for foxtail and 3 applications of 6 lbs. for crabgrass in turf did not give good results. With crops 3 and 6 lbs. on onions at three stages gave poor results on broadleaves and gave excellent control of grasses in pre-emerg. only with no effect on onion yield; 8 lbs. pre-emerg. on green beans gave good weed control and no injury; on canning peas 3, 6 and 9 lbs. pre-emerg. gave poor broadleaf control and 35, 60 and 60% control of grasses; in potatoes on muck 6 lbs. pre-emerg. gave 56% control of broadleaves and 51% of grasses; with flax 3 and 6 lbs. gave poor Setaria control over the entire season; in sorghum 4 and 8 lbs. pre-emerg. gave poor control of stinkgrass and pigweed but caused no crop injury; in two experiments on sugar beets results were (1) no control except with 16 lbs. which injured beets and (2) effective on grasses at 9 lbs.; two experiments on soybeans gave (1) no injury from 3 and 6 lbs. pre-emerg. and (2) 3, 6 and 9 lbs. were generally ineffective; and three experiments in corn gave (1) no crop injury and 67 and 80% weed control with 4 and 8 lbs. pre-emerg., (2) 8 and 12 lbs. pre-emerg. less effective than 1 1/2 lbs. 2,4-D and less than CDAA, and (3) 3, 6 and 9 lbs. pre-emerg. probably less effective than CDAA which controlled millet but not broadleaves. 2-Chloro-allyl-diethyldithiocarbamate (CDEC) (16 reports). Two studies with the wild oats gave (1) no control or crop damage with 3 and 6 lbs. pre- and post-emerg. and (2) no control of wild oats, foxtail or red root and no crop injury. With crops 8 lbs. pre-emerg. on green beans and sweet corn gave satisfactory weed control and no crop injury; on cucurbits 6 lbs. pre-emerg. gave temporary weed control and injured cantaloupes but not cucumbers and watermelons; on canning peas 3, 6 and 9 lbs. gave 10, 25 and 25% control of broadleaves and 10, 50 and 60% of grasses with only slight injury

to peas; on onions 6 lbs. gave poor broadleaf and fair grass control at pre-emerg. but was ineffective later; 6 lbs. pre-emerg. on potatoes on muck gave 67% control of broadleaves and 53% of grasses; with sorghum 4 and 8 lbs. pre-emerg. gave poor weed control and gave severe injury to sorghum; 3, 6 and 9 lbs. pre-emerg. was ineffective in sugar beets; three experiments on soybeans gave (1) no injury from 3 and 6 lbs. in a tolerance test, (2) and (3) weed control was not satisfactory with amounts ranging from 2 to 9 lbs. and three tests with corn gave (1) 4 and 8 lbs. less than 50% weed control, (2) 8 lbs. less effective than CDEA and CDAA and (3) 3, 6 and 9 lbs. apparently not satisfactory.

MECHANICAL CONSIDERATIONS

Summary

R. E. Larson

Spray Equipment. In the one abstract submitted for inclusion in this section, Larson reports on a study of factors influencing results of basal handgun applications for brush control. He has found the handgun and operator provide variations which will require new calibration if either factor is changed. Once the equipment has been calibrated with an orifice size, stem size, and bark condition, a change in any of these three factors will cause a predictable direction of change in the amount of spray material applied.

Tillage Equipment. In abstracts included in other sections, Keys found no difference in pre-emergence rod weeding and pre-emergence harrowing for controlling green foxtail (Setaria Viridis). In studies of cultural treatments of fallow and stubble for toadflax (Linaria vulgaris) control, Keys and Forsberg find it requires eleven tillage operations per season to maintain a black fallow condition and seven tillage operations to maintain a green fallow (5-8 days top growth before tillage). When plowing was included in the fallow sequence with cultivators and blade weeders there was no reduction in the number of operations but there was an apparent reduction in regrowth as compared to plots which were tilled with the shallow implements only. Studies by Friesen and Canvin indicate the use of a rotovator to be better than double discing as a means of incorporating IPC into the soil for the control of wild oats (Avena fatua).

Abstracts

Factors to be Considered in Using the Handgun for Basal Applications in Brush Control. Larson, R. E. Studies were set up to determine the factors which affect the volume applied when using the handgun for basal applications for brush control. Roughness of bark, size of stem, type of handgun, orifice size, and operator were factors included in the study. The effect of roughness of bark was studied by using hickory and oak stems as being representative of smooth and rough bark respectively. Three classes of stem sizes; 1 to 2", 2 to 3", and 3" and over were included. The diameters of the classes were assumed to be 1½", 2½", and 3½". The choice of handguns was based primarily on the type of shutoff and included two equipped with a trigger type shutoff and two with turn type shutoff valves. Water was used as spray material. The stem stand was 1600 per acre. The orifice sizes were .0781" (#5), .0937" (#6), .1250" (#8), and .1565" (#10). Three operators were used and all spraying was at 30 psi.

The results indicate no consistent differences due to type of shutoff on the handgun but there is a difference in the individual handguns. The amount of spray varied with the size of orifice and ranged from 32.9 gals/1000 stems with a .0781" (#5) orifice to 52.2 gals/1000 stems with the .1565" (#10) orifice. The size of stem resulted in a variation from 29.5 gals/1000 stems 1½" in diameter to 44.5 gals/1000 stems 3½" in diameter for one operator spraying with a #6 orifice. The rough bark condition used an average 13.7% more spray material than did the smooth bark. The operator provided one of the largest variations in that in one instance one man applied as much with a #6 orifice as another operator applied with a #8 orifice. (Contribution Farm Machinery Section, A. E. R. B., U. S. D. A., Columbia, Missouri.)

Basic Studies

W. E. Loomis

Summary

Progress in basic studies of weeds and weed control continues to be slow. Studies of residual action of herbicides show the possible dangers of use of herbicides on agricultural land. While rapid leaching of a herbicide may clear the surface soil, it can also result in retention of the berbicide in the subsoil layers where decomposition may be slow.

Control of weeds by insects is an interesting but, unfortunately, not always reliable method. Chemical analyses of treated plants should be expressed in such a manner that a decrease in one fraction does not automatically cause increases of other constituents - as it normally does when reports are made on a dry weight basis.

Inhibition of growth, as by amino-triazole, can prove to be very effective in weed control when it can be followed by cultivation or even by burning or mowing. Studies of chemical mixtures are valuable, even when the results are negative, as in the Wisconsin work.

An increasing knowledge of the waxy coverings of leaves indicates that cuticle as well as surface wax is involved in retention and penetration of herbicidal sprays. More work is needed on cuticle. Translocation is basic in rapid kill of deep rooted perennials. Responses to herbicides offer many opportunities for observation of the factors affecting this essentially unknown plant process.

Many annual plants are weeds only because of peculiarities of seed germination. More studies of weed-seed germination are needed. Perhaps the most serious deficiency in weed control work, however, is the lack of adequate data on losses due to weeds under varying conditions. We have assumed that weed control is desirable regardless of cost, and undoubtedly many recommendations are uneconomical in actual practice. It would be a major contribution to the weed problem if every worker could give serious attention to the quantitiative effects of weed control.

Abstracts

Absorption and Translocation of 2,4-D and P^{32}. George E. Barrier and W. E. Loomis. Radioactive phosphorus, P^{32}, has been used to study the absorption and translocation of this material in comparison with 2,4-D. Addition of wetting agents has a negligible effect on absorption of P^{32}, a maximum increase of 20% compared to 1000% or more for 2,4-D. Also, the temperature coefficient for absorption of P^{32} is 1.0 whereas that for 2,4-D is 2.0-3.0. These differences may be assumed to represent differences in the behavior of an inorganic ion and an unionized, organic molecule.

Temperature coefficients for translocation out of treated leaves averaged 2.0 for both materials. Also, translocation of both materials was dependent upon a supply of sugar in the exporting leaf. Sugar applied to starved leaves below the point of application of P^{32} has decreased translocation rather than increased it. P^{32} applied uniformly over a detached leaf may be almost completely assembled in the veins, even though no movement out of the leaf is possible. (Department of Botany and Plant Pathology, Iowa Agric. Exp. Sta., Ames, Iowa.)

Regrowth inhibition induced by maleic hydrazide and aminotriazole applications to mesquite seedlings. Behrens, R. Three month old mesquite seedlings were dipped

in 0.5 percent water solutions of aminotriazole (AT) and maleic hydrazide (MH) containing a wetting agent to insure uniform wetting of the plants. Treated and control plants were cut off above the cotyledonary node one, two and three weeks after treatment. One hundred percent of the control plants had initiated new growth at the cotyledonary node one week after cut off, while no regrowth was evident on treated plants. One month after the AT application, 54 percent of the plants that were cut off one week after treatment had regrowth at the cotyledonary node. No regrowth was evident on plants cut off two and three weeks after AT applications were made. Plants cut off one, two and three weeks following the MH treatments exhibited no regrowth one month after treatment. Seven months after treatment the regrowth percentages still remained at 54, 0 and 0 percent, respectively, for plants treated with AT and cut off one, two and three weeks after treatment. MH treated mesquite seedlings had regrowth on 40, 29 and 25 percent of the plants, respectively, when cut off one, two and three weeks after treatment. No plant kill had occurred due to MH or AT applications during the month following treatment. However, at the end of seven months all treatments contained dead plants. Plants that were cut off one, two and three weeks after the MH applications exhibited plant kills of 19, 29 and 29 percent, respectively. AT treated plants cut off one, two and three weeks after treatment had plant kills of 16, 35 and 41 percent, respectively. Apprently, AT applications inhibited regrowth for a longer period than MH. However, if no regrowth is desired in plants that will be cut off following treatment with AT, at least a two week delay between treatment and cut off is considered necessary if maximum inhibition is to be obtained. (Field Crops Research Branch, ARS, USDA and Texas Agri. Exp. Sta. College Station, Texas.)

Evaluation of (D), (L), and (DL)- Amino acid derivatives of 2,4,5-T as mesquite herbicides. Behrens, R., C. E. Fisher and C. H. Meadors. Amino acid derivatives of 2,4,5-T obtained from the Biologically Active Chemical Compound Section, Eastern Utilization Research Branch, ARS, were evaluated as herbicides on mesquite seedlings in 1955. The (L), (D) and (DL) forms of methionine, leucine, phenylalanine and threonine derivatives of 2,4,5-T were included in the test along with 2,4,5-T acid. All compounds were applied in 10 percent ethanol solutions containing 100 ppm. 2,4,5-T acid equivalent by dipping the plants and allowing excess solution to drain off. A detergent was added to each solution at the rate of one gram per liter to insure uniform wetting of the plant tissues. Final readings were made 60 days after treatment. In all cases the (L) form of a particular amino acid derivative of 2,4,5-T was more toxic than the (DL) form which in turn was more toxic than the (D) form. Of the treatments used 2,4,5-T acid was the most toxic, resulting in a 64 percent kill of mesquite seedlings. (L)-leucine-2,4,5-T approximately equalled 2,4,5-T acid in toxicity by killing 59 percent of the plants. Next in order of toxicity were (L)-phenylalanine, (L)-threonine and (L)-methionine derivatives of 2,4,5-T with 45, 18 and 9 percent plant kills, respectively. Plant kills for (DL)-leucine-2,4,5-T, (DL)-phenylalanine-2,4,5-T, (DL)-threonine-2,4,5-T and (DL)-methionine-2,4,5-T were 45, 13, 13 and 5 percent in that order. Treatments with (D)-amino acid derivatives of 2,4,5-T resulted in some terminal bud kill but no mesquite seedlings were completely killed by this group of compounds. (Field Crops Research Branch, ARS, USDA and Texas Agri. Exp. Sta., College Station, Texas.)

Residual effect of TCA, CMU, Dalapon and DB granular. Brown, D. A. These chemicals have been applied to heavy stands of couch grass over a period of years at the following rates TCA 25, 50, 75, 100 lb./A. CMU and Dalapon at 20, 40, 60, 80 lb/A. DB granular 2.5 and 5 lb/100 sq. ft. Over a seven-year period of testing it has been found that TCA at 25 lb/A. holds the soil sterile for six weeks to two months. At 100 lb/A. sterility disappears at the end of two years. CMU four years after application permitted near normal crops of grain following 20 lb/A; 40% crop

on 40 lb/A.; 20% on 60 lb/A. but complete sterility to grain crops at 80 lb./A. rate. Sterility following Dalapon, tested only since 1953, indicates two years after application 80% grain crop on 20 lb. application; 60% on 40 lb.; 30% on 60 lb.; and 15% on 80 lb./A. rate. DB granular, used first in 1954 prevented growth of grain crops in 1955 at both rates of application but Russian thistle grew in profusion, green foxtail less profusely and volunteer alfalfa grew well from established deep rooted plants. (Experimental Farm, Brandon, Manitoba.)

The residual effect of CMU and PDU on some cereal crops. Carder, A. C. In mid-May seed-beds were prepared: 1) where 10-, 20-, 40- and 80-lb/A rates of activ CMU had been applied three years previously on couch turf and where almost complete to complete kills of couch had been obtained and 2) on areas treated with 40- and 80-lb/A rates of active PDU and a 40-lb/A rate of CMU two years previously where the couch had been virtually destroyed. On all seven areas plots of Redwing flax, Chancellor peas, Olli barley, Saunders wheat and Beaver oats were sown. Two weeks after seeding all cereals had emerged and appeared normal. Six weeks after seeding no worthwhile crop remained wherever 20 or more pounds of CMU had been applied three years previously. Where 10 lb/A had been used a 50% stand of flax and 40% stand of peas remained. The flax appeared vigorous and ripened normally, while the peas remained unthrifty. Stand and vigour of the other cereals were spotty and poor, respectively. Where CMU had been applied two years previously at 40 lb/A there were no worthwhile stands, although flax again appeared most tolerant to the chemical. The residual effect of PDU proved less than that of CMU but even with this chemical no worthwhile stands remained of any crop. Of the five cereals tested peas proved the most tolerant to PDU, while flax exhibited slightly more tolerance to it than the grass cereals. (Experimental Farm, Beaverlodge, Alberta.)

Effect of 2,4-D on the uptake and distribution of potassium by bean plants. Cooke, Anson R. Bean plants, var. Top Crop, were grown in 4 inch pots until the first trifoliate leaf was fully expanded. One half of the plants were then sprayed with 100 ppm 2,4-D containing 0.5% Joy as a wetting agent. Five hours later, 355 microcuries of K^{42} in 50 ml of water were added to the soil of each pot. Both the control plants and the plants sprayed with 2,4-D were then sampled at several intervals during the next 24 hours. The sampled plants were divided into a number of parts, weighed, and the activity of the parts counted directly with a Geiger counter. At the end of 8 hrs. after spraying with 2,4-D, the sprayed plants had taken up 4 to 5 times as much potassium as had the controls. On a fresh-weight basis most of the activity was located in the hypocotyl and the first internode and in decreasing amounts in the primary leaves, meristematic area and the trifoliate leaf. However, at the end of 24 hrs. after treatment with 2,4-D the treated plants contained approximately half as much potassium as did the controls. The distribution at this time was about the same as at the end of the 8 hr. sampling. These effects of 2,4-D on the uptake of potassium by bean plants are probably not specific for potassium but may be correlated with the effect of 2,4-D on plant respiration as reported in the literature. The increased uptake of potassium during the initial periods can be due to the stimulation of respiration that takes place immediately after treatment with 2,4-D, while after a period of time 2,4-D will inhibit respiration and consequently there will be a decrease in absorption of potassium and other ions from the soil. (Dept. Botany and Plant Pathology, Oklahoma Agri. Exp. Sta., Stillwater, Oklahoma.)

Effect of CMU on the biochemical composition of several legumes. Cooke, Anson R. Four different legumes, Madrid Sweet Clover, Ohio Evergreen Sweet Clover, Buffalo Alfalfa, and Korean Lespedeza, were treated in the field on June 9th with Karmex DL at the rate of 1 lb of active ingredient per acre. Eleven days later the

plants were harvested and dried in a force-draft oven. Control plants were harvested at the same time. The results of chemical analyses of the total tissues above ground are shown in the following table (data are expressed as percentages of unsprayed controls on a dry-weight basis):

Species	Sucrose	Total Sugars	Soluble N	Total N	Pectin
M. S. Clover	36.5	56.9	166.1	114.0	87.8
O.E.G.S. Clover	27.6	44.2	165.4	119.5	85.6
Buffalo Alfalfa	20.6	31.0	152.3	119.7	
Korean Lespedeza	8.9	48.7	119.6	108.3	84.6

Treatment with CMU brought about a large decrease in the sugar content of the plants, while at the same time there was a considerable increase in the soluble-nitrogen fraction of the plant. The decrease in sugars may be due to an interference of CMU with photosynthesis or to an increase in sugar utilization. The nitrogen analyses suggest that the treated plants absorbed and utilized somewhat more nitrogen than did the control plants, although the rapid loss of sugars would automatically increase N percentages on a dry basis. (Dept. Botany and Plant Pathology, Oklahoma Agri. Exp. Sta., Stillwater, Oklahoma.)

Relative sensitivity of wild buckwheat and mustard seedlings to varying concentrations of 2,4-D and MCP solutions. Corns, Wm. G. and Wm. Vander Born. Wild buckwheat and commercial mustard seeds were grown in Petri dishes containing vermiculite moistened with concentrations of 2,4-D or MCP esters ranging from 1 ppm. to 0.0025 ppm., Graphs of root and shoot measurements indicated slight stimulation from appropriate low concentrations (buckwheat 0.04 ppm., mustard 0.003 ppm.) followed by sharp decline at higher concentrations of chemicals. That is to say, maximum stimulation and inhibition were reached at lower chemical concentrations for mustard than for buckwheat. There was no clear difference between chemicals tested. This method may be useful as a supplementary means of evaluating herbicides. (Div. Crop Ecology, Dept. Plant Science, University of Alberta.)

Effect of 2,4-D on young tomato plants. Dabbs, D. H. and Forsberg, D. R. Potted plants of Early Chatham tomato were subjected to the spray drift of 2,4-D butyl ester at distances varying from 0 to 96 rods from the sprayer. Spraying was done at 11:40 A.M. on July 15 with a wind speed of 11 M.P.H. A single pass was made with the sprayer, delivering herbicide at the rate of 5 oz. acid equivalent/A. A check treatment was included. Each experimental unit consisted of three plants and four replications were used.

The plants were removed from the five inch pots on July 19 and transplanted to the garden in a randomized block design. At no time during the growing season did any adverse effects show on the foliage of any plant. Analysis of data for total yield of fruit showed no significant differences. However, there was a trend which showed higher yields at the intermediate distances and lower yields at the 0 distance and for the check plants.

More positive results may have been obtained had younger plants been subjected to the drift for a longer period of time about three weeks earlier in the season. (Experimental Farm, Scott, Sask.)

Effect of herbicides on the control of grass in trees. Forsberg, D. E. In July, 1955, square rod plots in an old shelter belt were top sprayed with various

herbicides to control the growth of grass under trees. The following chemicals were used; Dalapon at 30 and 50 lbs/A; TCA at 50 and 75 lbs/A, Amizol at 6 lbs/A, ACP-L-705A (2,2,3 trichloroproprionate) at 8 lbs/A, and ACP-L-705A at 8 lbs/A plus 4 lbs/A of Amizol. Type of trees in this shelter belt were honeysuckle, poplar, caragana, spruce, crab-apples, and plums. Predominating grass was brome and Canada blue grass.

Results- In the fall of 1955 very good control of grass was noted on all plots. However, there was slight regrowth occurring on the Amizol and the lower rates of Dalapon. The onlywoody plant affected by the spray was the honeysuckle. Final results of this test will not be known until 1956. (Experimental Farm, Scott, Sask.

Gastrophysa polygoni L. a bettle which attacks wild buckwheat (Polygonum convolvulus). Forsberg, D. E. In June of 1955 larvae of Gastrophysa polygoni L. were noted on the leaves of wild buckwheat at the Experimental Farm, Scott, Sask. These larvae were black in color and about the shape of potato beetle larvae only smaller. Their damage was characterized by skeletonizing of the buckwheat leaf. Within one week several adult beetles of this species were noted, and fields were soon heavily infested. The bettle is characterized by a dark blue abdomen, red thorax and a dark blue head. Both the adult and larvae were only parasitic to wild buckwheat and did not harm any of the graincrops or weeds other than wild buckwheat that were present in the field. Ideal conditions over the past three years appeared to be advantagous to the outbreak of this bettle. In the past three years buckwheat has been abundant, along with ideal moisture and weather conditions. Outbreaks of this beetle were very common around Scott, extending south to Kindersly and north to Glaslyn. Its presence this year was also noted at Rosthern, Laird, Bounty and Rodville. This insect may prove to be very beneficial in controlling wild buckwheat. (Experimental Farm, Scott, Sask.)

Leaching of alpha-chloro-N,N-diallyacetamide (DCAA) in Fargo clay. Helgeson, E. A. and Andersen, Robert N. In general the method of Warren (NCWCC Proceedings 1954, page 5) was used in this test. CDAA at 10 lb/A was applied to the surface of Fargo clay soil in 1 gal paper cartons (6-3/4 inches in diam.). The soil was saturated and allowed to drain 24 hr. prior to application of the chemical. The material was leached 24 hr. later with 2 inches of simulated rainfall. Twenty-four hr. later the columns were cut into slices so that the 0-$\frac{1}{4}$, $\frac{1}{4}$-$\frac{1}{2}$, $\frac{1}{2}$-3/4, 3/4-1, 1-2, 2-3, and 3-5 inch layers were sampled. Soil from these layers was planted with domestic ryegrass seed. Absence of ryegrass seedlings 24 days after planting indicated the presence of a lethal concentration of chemical in the upper 1/4 inch layer. The material was leached so that extremely toxic (to the ryegrass) concentrations were present in the $\frac{1}{4}$-$\frac{1}{2}$, $\frac{1}{2}$-3/4, 3/4-1, and 1-2 inch layers. Ryegrass planted in the 2-3 inch layer was moderately to slightly affected. Little or no effect was noted on ryegrass grown in the 3-5 inch layer. (North Dakota Agric. Expt. Sta., and Field Crops Research Branch, A.R.S., USDA, Fargo, N. D.)

Formation and Occurrence of surface wax on plants. Schieferstein, R. H., and Loomis, W. E. Two-stage, positive surface replicas of mature leaves of a number of plant species have been observed with an electron microscope. Closely related plants usually had similar surface patterns but at times the surface pattern was very different, even between species of the same genus. Most grasses studied had a wax pattern similar to that of Zea, but Seteria lutescens had a much heavier and different type of structure. Seteria faberii and S. viridis had wax patterns similar to other grasses. Panicum capillare was the only grass studied that showed no surface wax. The legumes as a group showed a characteristic wax pattern. For reasons unknown, Polygonum aviculare had a wax pattern similar to legumes. Trifolium repens had the legume wax pattern only on the upper surface of the leaves. No wax was

detected on the lower surface. Nicotiana glauca showed heavy wax deposits but N. tobacum had none. Below are lists of species on which surface wax has and has not been observed.

Wax bearing	Non wax bearing
Zea mays	Panicum capillare
Seteria faberii	Solanum rostratum
Seteria viridis	Solanum nigrum
Seteria lutescens	Solanum tuberosum
Digitaria sanguinalis	Petunia violacea
Saccharum officinarum	Nicotiana tabacum
Amaryllis vittata	Gossypium hirsutum
Brasica oleracea	Ambrosia trifida
Nicotiana glauca	Ambrosia artemisiifolia
Glycine max	Polygonum persicania
Trifolium repens	Xanthium italicum
Trifolium pratense	Ipomoea purpurea
Melilotus alba	Convolvulus arvensis
Pisum sativum	Cirsium vulgare
Polygonum aviculare	Cirsium arvense
Lathyrus adoratus	Plantago lanceolata
Berberis thunbergii	Plantago major
Lonicera sp.	Lycopersicum esculentum
Musa sp.	Asplenium nidus
Rosa carolina	Mesembryanthemum cordifolium
Kalanchoe pinnata	
Kalanchoe marmorata	
Tropaeoleum sp.	
Aloe sp.	
Agave sp.	
Picea pungens	
Mesembryanthemum lingua	
Peperomia sp.	

The development of wax on the primary leaf of corn has been studied in detail. The embryonic leaf, taken from the coleoptile, had no detectable wax and an undeveloped cuticle. The first material to appear on the surface, just as the leaf broke through at the tip of the coleoptile, did not appear crystalline and could have been either a liquid solution or a soft paste. Crystalline wax was apparent by the time the leaf was unrolled but still expanding. Increase in the amount of wax was apparent until the leaf was fully expanded but no change was noted after this time. Differences in wax formation due to differing temperatures, light conditions and humidities were not striking with those young seedlings.

With fully grown corn plants it was found that only the bottom five or six leaves and possibly the top two leaves had definite wax deposits. This did not appear to be an environmental response.

Regeneration of wax was demonstrated on young cabbage leaves. As with corn, the first material to appear on the surface of leaves, from which most of the wax had been removed by wiping with dry cotton, was not crystalline. Solid wax was apparent however, four days after dewaxing. Older leaves that were dewaxed just as they were turning yellow did not regenerate wax deposits.

The pathway of wax through the cuticle remains unknown. Pores are indicated in some species but in this study they appeared as pits in the surface not extending through the cuticle. None of these pits were observed in extensive studies on corn. (Dept. Botany and Plant Pathology, Iowa Agr. Exp. Sta., Ames, Iowa.)

Influence of plant stand and soil fertility on the yield losses resulting from infestations of annual grasses in corn. Staniforth, D. W. An area infested with *Setaria viridis* and *S. lutescens* was planted with a single cross corn hybrid at rate of 12,000 and 16,000 plants per acre in 40 inch hills. Optimum amounts of P and K fertilizers were applied to the area prior to planting. Nitrogen fertilizer at rates of 0, 70 and 140 pounds per acre of elemental nitrogen was applied shortly after corn planting. All plots were cultivated to remove weeds from between the hills and to leave moderate to heavy infestations of *Setaria spp.* in the hills of corn. These infestations were then removed at each of five stages of corn development, and the plots kept in a weed-free condition for the remainder of the growing season. Stages of removal were; at corn emergence, corn with 8-10 leaves emerged, two weeks before tasselling, at tassel emergence, and at corn maturity. Yields of weeds at each date of removal and yields of corn at maturity were obtained. This experiment was conducted in 1954 and 1955, on the same area of land.

Results- The growing seasons of 1954 and 1955 were essentially similar at the location of these two experiments. Yields of 90-100 bushels per acre were obtained in both years when corn was maintained in a weed-free condition over the season, and received 70 or 140 pounds of nitrogen fertilizer. Weed infestations were larger in 1955 and produced larger reductions in corn yield than in 1954. In 1954 corn with 12,000 plants per acre and fertilized with 70 or 140 pounds of nitrogen, contained infestations of grass weeds which averaged 500 pounds per acre of dry matter at maturity. These weed infestations produced non-significant yield reductions of 2 and 4 percent. Plots with the same stand of corn, but receiving no nitrogen fertilizer had infestations which averaged only 390 pounds per acre, but which produced significant yield reductions of 9 percent. With corn stands of 16,000 plants per acre the yields of weeds were slightly less than with 12,000 plant stands, for comparable levels of nitrogen. Reductions in yields of corn were 0, 7 and 11%, for nitrogen applications of 140, 70 and 0 pounds per acre, respectively. In 1955 yields of weeds were essentially similar for the combinations of nitrogen fertilization and corn plant stands, averaging from 800 to 900 pounds of dry matter per acre. These infestations of weeds produced significant yield reductions in all six of the stand-fertilizer level combinations. With 12,000 plants per acre these reductions were 7, 17 and 36 percent, for nitrogen fertilizer levels of 140, 70 and 0 pounds per acre, respectively. With 16,000 plants per acre the comparable reductions were 7, 14 and 31 percent. (Dept. Botany and Plant Pathology, Iowa Agr. Exp. Sta., Ames, Iowa.)

Studies on laboratory methods for germinating weed seeds. Steinbauer, G. P., Grigsby, B., Correa, L., and Frank, P. (In press, to appear in Proc. Assoc. Off. Seed Anal. 1955). Directions are given for laboratory germination of the seeds of 29 species of weedy plants of the Cruciferae, Caryophyllaceae, and Solanaceae. Tests were run on both freshly harvested and older seeds. Dormancy was frequent immediately after harvest and often persisted for several months. (Michigan State Univ., Agri. Exp. Station, E. Lansing, Mich.)

Effect of ionic additives on the activity of 2,4-D when applied to soybeans. Szabo, Steve S., and Buchholtz, K. P. Soybeans at the third trifoliate leaf stage were treated with 0, 0.25 and 0.50 lb/A of 2,4-D as an amine preparation alone and in combination with a low and high rate of an ionic mixture consisting of copper, zinc, iron, manganese, and boron. Copper was applied as $CuSO_4$, zinc as $Zn(NO_3)_2$, iron as $FeC_6H_5O_7$, manganese as $Mn(NO_3)_2$, and boron as $H_2B_4O_7$.

The low rate of the ionic mixture contained 0.25 lb/A each of Cu and Zn, 0.5 lb/A each of Fe and Mn, and 0.1 lb/A of B, while the high rate contained 0.5 lb/A each of Cu and Zn, 1.0 lb/A each of Fe and Mn, and 0.2 lb/A of B. These mixtures were applied alone and in all combinations with 0, 0.25 and 0.5 lb/A of 2,4-D using water equivalent to 20 gal/A. The treatments were applied to plots of soybeans consisting of 5 rows spaced 6 inches apart and 12 feet long. Yields, reported as average dry weight per acre, were taken from the center row of each plot when the untreated soybeans were about 24 inches tall. Only that part of the plants were harvested that had developed above the third trifoliate leaf.

Ionic mixture	Yields with various applications of 2,4-D -lb/A		
	0	0.25	0.50
None	3991	726	483
Low	3990	1946	1757
High	3417	2176	1814

LSD at the 5 pct. level - 575

The ionic mixtures when applied alone did not significantly affect the yields of the soybeans. When the ionic mixtures were applied in combination with 2,4-D the activity of the 2,4-D was reduced materially. The high rate of the mixture was somewhat more effective than was the low rate. (Dept. of Agronomy, Univ. Wisc., Madison, Wisc.)

Chemical analyses of post oak (Quercus stellata) to determine food reserves of stumps and roots treated with herbicides. Webster, J. E., and Elder, W. C. In 1951 several large uniform post oak trees were selected for the study and divided into four groups. Some of the trees were not disturbed. In one group the trees were cut off 18 inches above ground and treated heavily with a mixture of 2,4-D and 2,4,5-T esters in diesel oil; in another group the trees were cut and the sprouts were allowed to grow; and in the fourth group the trees were cut and the sprouts removed. Samples for chemical analyses were secured from the stumps and trees by collecting the shavings from a one-inch wood auger boring. Smaller augers were used to collect samples from the tree roots. The samples were taken bi-monthly except during the active growing period, when they were taken each month. The original trees were used for 18 months, then discarded and new trees selected. Chemical analyses from each sample included the determinations for water, ash, reducing sugars, sucrose, total sugars, acid-hydrolyzable material, alcohol soluble nitrogen, total nitrogen and soluble solids. Results from 3 1/2 years data indicate that in the stumps the total nitrogen has been low in July with peaks from March to May. The treated stumps, although apparently dead, still maintain a supply of nitrogen similar to the untreated stumps. Soluble solids do not vary as much as the total nitrogen; however, the treated stumps were somewhat lower when compared with the untreated stumps. Total sugars reached a peak concentration in mid-winter and a low period occurred from March to May. In the treated stumps total sugars remained equal to the untreated for a considerable time after the chemicals were applied. In the roots the soluble solids and the total sugars varied similarly to the stumps. Total nitrogen in the roots was more constant throughout the year, with the treated only slightly lower than the untreated. (Oklahoma Agri. Exp. Sta., Stillwater, Oklahoma.)